EXHIBIT 39
[FILED UNDER SEAL]

UNITED STATES DISTRICT COURT

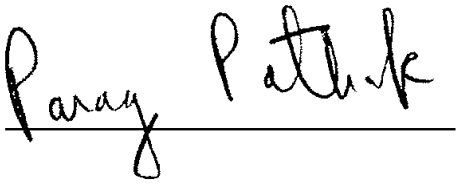
EASTERN DISTRICT OF TEXAS

SHERMAN DIVISION

The State of Texas, et. al. Plaintiff, v. Google LLC, Defendant.	Case No: 4:20-cv-00957

Expert Report of Parag Pathak

June 7, 2024



Parag Pathak

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II. ASSIGNMENT

1. On December 16, 2020, a multistate coalition led by the State of Texas filed a lawsuit against Google LLC (Google) asserting violations by Google of federal and state antitrust laws and violations of other state laws, in connection with Google's conduct in the online display advertising industry and as to digital advertising technologies ("Ad Tech" or "Ad Tech stack"). Currently, 16 States (Texas, Alaska, Arkansas, Florida, Idaho, Indiana, Kentucky, Louisiana, Mississippi, Missouri, Montana, Nevada, North Dakota, South Carolina, South Dakota, and Utah) and the Territory of Puerto Rico are Plaintiffs in the case (Plaintiff States). I was retained in July 2021 to provide expert analysis and opinions on behalf of the Plaintiff States.

2. I have been asked by counsel for the State of Texas, on behalf of all Plaintiff states in this case, to apply my expertise in market design to analyze the incentives motivating Google's conduct at issue in this case. Using market design principles, I compare Google's conduct with efficient functioning markets. I have also been asked to apply my market design expertise to identify the nature of remedies that would restore competition. I do not provide conclusions about whether Google's conduct is anticompetitive, but I have been instructed to accept certain conclusions in this regard provided by Professor Joshua Gans, another expert retained by the Plaintiff states.

3. To undertake my assignment, I have been asked to analyze the following Google conduct:

   A. The connections Google established between its display advertising server, DoubleClick for Publishers ("DFP"), and its display advertising exchange, AdX (including the tie and Google Ads Exclusivity to AdX)
   B. Google's deployment of Dynamic Allocation ("DA")
   C. Google's deployment of Enhanced Dynamic Allocation ("EDA")
   D. Google's response to Header Bidding
   E. Google's deployment of Unified Pricing Rules ("UPR")
   F. Google's deployment of Project Bernanke
   G. Google's deployment of Dynamic Revenue Share ("DRS")
   H. Google's deployment of Reserve Price Optimization ("RPO")

4. A list of all documents referred to in this report and relied upon by me in forming my opinions in this case is attached as Appendix B.

5. I understand that document productions are ongoing in this case and that additional relevant documents may be produced in this case by Google and third parties right before and after I issue this report. I may, and reserve the right to, review and rely on additional documents in conducting my work and forming my opinions in this case. I reserve the right to supplement or amend this report if my opinions change or require supplementation as a result of my ongoing review of documents.

6. In preparing this report, I was assisted by a research team under my direction. I am compensated at a rate of $1,200/hour. My compensation is not contingent upon my opinions or the outcomes of this matter.

A. Basis for Opinions

7. The opinions in this report are based on my specialized knowledge, experience, and training in the field of economics, particularly as they relate to the market design. My opinions are based on my review of documents and testimony from this litigation provided by the counsel for the State of Texas.

8. I have spoken to Professor Gans regarding his analysis of the relevant markets, market power, and anticompetitive effects. I rely on Professor Gans' findings on market power and market definitions.[1] I also rely on Professor Gans' findings on anticompetitive effects of Google's conduct and consider them in my proposals to resolve Google's conducts. I also rely on Professor Chandler's analysis of the Ad Tech industry.

III. QUALIFICATIONS

9. I am the Class of 1922 Professor of Economics at MIT. I am also a Research Associate at the National Bureau of Economic Research, where I am the founding co-Director of the Working Group on Market Design. I hold an A.B. in Applied Mathematics and Economics, an S.M. in Applied Mathematics, and a Ph.D. in Business Economics from Harvard University.

[1] Relevant markets include: Market for publisher ad servers for the selling of open web display advertising space ("Ad Server Market"; Market for ad exchanges for transacting indirect open web display advertising ("Ad Exchange Market");
Market for ad buying tools for small advertisers for buying open web display advertising space ("Ad Buying Tools for Small Advertiser Market"); Market for ad buying tools for large advertisers for buying open web display advertising space ("Ad Buying Tools for Large Advertiser Market").

10. My main research focus is in market design, a branch of microeconomics that studies the design and performance of market-clearing institutions. My research and teaching are on matching, auctions, platforms, centralized trading systems, and other resource allocation systems. I have been awarded teaching prizes, including the MIT Graduate Economics Association Teacher of the Year award, and the Undergraduate Economic Association Teaching Award. I have written extensively on market design in a variety of contexts. I have published over 50 peer-reviewed papers in the American Economic Review, Econometrica, Quarterly Journal of Economics, Journal of Political Economy, Journal of Financial Economics, among others.

11. My research was recognized with a Presidential Early Career Award for Scientists and Engineers and an Alfred P. Sloan Fellowship. I have been included in the IMF's list of the 25 top economists under age 45 in 2014. In addition, I have been included in the Economist magazine's list of the Decade's Top Eight Young Economists in 2018. In 2018, I was awarded the John Bates Clark Medal by the American Economic Association as the best American economist under age 40. The prize citation lists my influential contributions to the field of market design.

12. I am the founding co-director of the National Bureau of Economic Research's working group on Market Design. My research in market design has had substantial real-world impact. I am also the founder of MIT's Blueprint Labs, a laboratory focused on market design applications for practical real-life problems, especially in education. I have helped design the school choice system in New York, Boston, Chicago, Denver, Newark, New Orleans, and Washington, D.C., rationing systems used for pandemic medical resource allocation, and the job market clearinghouse used by the United States Military Academy and ROTC.

13. My research has been supported by research grants from the National Science Foundation, the Institute for Education Sciences, the WT Grant Foundation, the Gates Foundation, the Smith-Richardson Foundation, the Laura and John Arnold Foundation, the Walton Foundation, the Boston Foundation, and the Lincoln Institute for Land Policy.

14. I am currently serving as co-Editor of Econometrica, a leading professional academic journal of economics. I have also served as an Associate Editor at the American Economic Review and Journal of Political Economy.

15. My curriculum vitae is attached as Appendix A to this report.

IV. SUMMARY OF OPINIONS

16. The "Ad Tech Stack" has three distinct entities – publishers, advertisers, and exchanges – each with distinct incentives. Publishers seek to maximize the value they receive from selling display advertisements. Advertisers seek to maximize the value they receive from the advertisements they purchase. Exchanges seek to maximize revenue by finding the best matches between publishers and advertisers.

17. Buyers and sellers in marketplaces have opposing interests. A buyer wishes to pay less for an impression, while a seller wants to receive more. The marketplace operator wishes to maximize trading volume and steer traffic to its exchange over competing alternatives. Because Google is involved with all three entities, it has an inherent conflict of interest. Maximizing the interests of one type of participant may harm the interests of another type of participant. Google's conduct in the Ad Tech Stack results from conflicts of interest due to being involved in all sides of digital advertising transactions.

18. Well-functioning digital advertising marketplaces should aim to maximize the surplus of their participants. Publishers benefit from the opportunity to match and transact with more advertisers. Advertisers benefit from the opportunity to match and transact with more publishers. Market clearing rules and the terms of trade should be made known to all participants so they can make optimal choices. Participants should have a clear understanding of how their actions, such as their bidding behavior or setting price floors, translate into market outcomes, such who is matched together, what prices participants paid, and why they paid them. A marketplace with more participation will lead to more opportunities to find matches and more total surplus. Moreover, marketplace participants should compete on a level playing field, where they feel safe and do not need to worry that some participants have unfair advantages because of information asymmetries or special arrangements.

19. The anticompetitive conduct discussed by Professor Gans has resulted in digital advertising marketplaces that do not function well because they do not follow these principles. Specifically:

    A. Google's requirement that publishers who use its DFP ad server must license Google's AdX worked against the interests of publisher customers by limiting their choice and protected AdX from the threat of disintermediation. Google Ads exclusivity to AdX denied advertisers the option to participate on other third-party exchanges, where they could have found better matches and realized greater surplus.

B. Google's Dynamic Allocation and Enhanced Dynamic Allocation distorted the playing field in its favor because Dynamic Allocation was solely granted to AdX and not competing exchanges. Google's conduct prevented the emergence of innovative tools, like yield managers, which would give publishers more decision-making ability over how inventory was routed. Google's mandatory requirement that publishers use Enhanced Dynamic Allocation if they use AdX removed publisher flexibility.

C. Google's effort to impede the adoption of Header Bidding prevented the participation of competing exchanges and the development of a thicker marketplace, where competition between exchanges could take place on the merits. This, in turn, reduced overall marketplace efficiency and the total surplus of the marketplace.

D. Google's Unified Pricing Rules gave preferential treatment to AdX and Google's ad buying tools to the detriment of publishers. UPR reduced the ability of publishers to maximize revenue by setting different reserve prices for distinct demand sources and limited their ability to ensure high-quality advertisements. These restrictions on publisher choice were done to benefit AdX.

20. Google also deployed deceptive conducts which lowered transparency for publishers and advertisers:

A. Google's deployment of Project Bernanke, Dynamic Revenue Sharing, and RPO reduced transparency for publishers and advertisers to benefit AdX. These non-disclosed conducts made it difficult for market participants to best respond to market rules and understand how their actions translate into market outcomes.

21. Competition and marketplace efficiency can increase if Google's anticompetitive conduct is stopped and Google does not have the incentives to engage in similar conduct in the future. The nature of structural remedies is that they resolve the underlying incentive issues at the root cause of Google's pattern of conduct where it uses its position in one tool to affect another tool. Behavioral remedies can also foster competition and increase transparency, but they will require intensive monitoring and will only manage, not resolve, the underlying conflicts of interest.

22. Structural divestiture of Google's ad server DFP is an appropriate remedy to resolve conflicts of interest and restore competition in the Publisher Ad Server Market and Ad Exchange Market. If Google's publisher ad server were separated from AdX, then AdX would have the appropriate incentives to grant access to other third-party ad servers to increase participation. It would not have any reason to restrict inventory so that it would be more attractive to advertisers and would be forced to compete with other exchanges to attract volume by lowering prices or offering product innovations. Publishers would also be free to multi-home across exchanges to maximize the value of each of their impressions. The possibility of multi-homing would force Google's publisher ad server to compete on price and to innovate to attract publishers.

23. Behavioral remedies to resolve the conflicts of interest must require non-discriminatory interoperability between third-party ad servers and AdX, between Google Ads and third-party exchanges, and between Google's publisher ad server and third-party exchanges. Publishers and advertisers should have tools where they can judge the effects of their actions. To be effective, these behavioral remedies will need to include data firewalls, customer best interest duties, and disclosure of transaction data and routing practices. This full suite of behavioral remedies will require oversight and monitoring because of the strong temptation to circumvent their implementation. The most effective remedy will be divestiture of the ad server complemented by behavioral remedies to provide transparency and ensure publishers and advertisers feel safe participating in Google's marketplace.

24. If additional fact evidence or data analysis should become available after the submission of this report, I reserve the right to modify or amend my opinions.

V. METHODOLOGY

25. In this section, I outline the economic analysis that I undertake in my report.

26. To analyze the display advertising technologies at issue, including Google's conduct therein, and to compare Google's conduct to efficient functioning markets, I apply concepts and principles from the economic field of market design, which I detail in Section VI. Market design is rooted in principles of game theory, which dates back as early as the 1920s from research by John von Neumann. Market design also incorporates matching theory initiated in the 1960s by David Gale and Lloyd Shapley.[2] In 2012, Lloyd Shapley and Alvin Roth won the Nobel Prize in Economics for their work relating to market design, including application of their market design principles to real-world marketplaces.[3]

27. In doing so I analyze facts, including documentary evidence and testimony, surrounding the markets harmed by Google's conduct. In my analysis of these facts, I apply concepts and principles from the field of market design. These concepts and principles are discussed further in Section VI.

[2] Gale, D., and Shapley, L. (1962). *College Admissions and the Stability of Marriage*. American Mathematical Monthly, 69: 9-15.

[3] "The Prize in Economic Sciences 2012." Nobel Prize Outreach AB 2024. (Jun 6. 2024). Accessed on June 4, 2024. Available at https://www.nobelprize.org/prizes/economic-sciences/2012/summary/

28. Counsel have asked me to identify remedies that restore competition in the markets harmed by Google's conduct. In order to assess what it means to "restore competition" in these markets, I evaluate the history and nature of the conduct that Professor Gans has found to be anticompetitive. Professor Gans' analysis has found that Google's conduct led it to establish monopoly power in the Markets for Publisher Ad Servers for selling display advertising and in the Market for Ad Exchanges for transacting indirect display advertising and that Google's conduct foreclosed competition from rivals. Google's long-held dominant position and the restrictions it has imposed on customer use of its tools means that these markets have not recently been competitive. Thus, "restoring" competition requires enabling and increasing meaningful competition that has to date been foreclosed by Google's conduct. To effectively increase competition the remedy must remove or substantially reduce the barriers to entry that arise from Google's conduct in markets harmed by this conduct.

VI. MARKET DESIGN FRAMEWORK FOR ANALYZING GOOGLE'S CONDUCT

29. Throughout my analysis of the "Ad Tech Stack" and display advertising technologies at issue, hereafter "display advertising," I apply concepts, frameworks, and techniques commonly used in the field of economics known as market design. Market design employs the tools of economics and game theory to analyze and design rules of markets to make sure that the outcomes of these markets satisfy certain desired properties related to efficiency, transparency, straightforward incentives, and participation.[4]

30. I use market design concepts, frameworks, and techniques to analyze how Google's conduct has affected marketplace efficiency[5] for its publisher and advertiser customers. I also analyze the incentives, including possible conflicts of interest, are at the root of Google's conduct.

31. In addition, I use market design concepts, frameworks, and techniques to analyze the nature of remedies that would increase competition. In my analysis of potential remedies, I take Professor Gans' anticompetitive effects as given.

[4] Throughout the report, I use the phrase "matching market" to refer to any situation that enables interaction between potential trading partners, leading to a match between them. I do not use the word market to refer to what is understood typically in the analyses related to antitrust, unless clearly specified.

[5] I discuss marketplace efficiency at ¶42. "Marketplace efficiency measures the quality of matches a marketplace facilitates between buyers and sellers, relative to the best possible theoretical matches."

32. The field of market design extends from the branch of game theory called matching theory initiated in the 1960s by David Gale and Lloyd Shapley.[6] The field has gone through a revival of practical applications to real-world problems through the 21st century.

33. A simple explanation of a market design approach is that market design economists uncover the sources or root causes of market failures and study and propose how to design a marketplace's rules to fix failures.[7] Market failures may occur depending on the particular features of market rules. In economics, a market failure is defined as a situation in which a market does not realize certain performance goals such as the efficient allocation of resources.[8] Markets can fail because of market power, information asymmetries, or several other reasons.

34. Alvin Roth, a pioneer in the field of market design,[9] provides an overview of the theory and several applications of market design in a 2018 paper based on his Presidential Address to the American Economic Association.[10] He likens the discipline of market design to "economic engineering," and points out that although each problem may require a custom-designed solution, all problems have common considerations. One common consideration is marketplace **efficiency**. Marketplace efficiency measures the quality of matches a marketplace facilitates between buyers and sellers, relative to the best possible theoretical matches.[11] For example, if a seller with a cost of $1 is matched to buyer 1 with a willingness to pay of $3, the surplus associated with the match is $2. If another buyer 2 has a willingness to pay of $5, the surplus associated

[6] Gale, D., and Shapley, L. (1962). *College Admissions and the Stability of Marriage*. American Mathematical Monthly, 69: 9-15.

[7] "This Handbook chapter seeks to introduce students and researchers of industrial organization (IO) to the field of market design. We emphasize two important points of connection between the IO and market design fields: a focus on market failures—both understanding sources of market failure and analyzing how to fix them—and an appreciation of institutional detail." *See* Agarwal, N. and Budish, E. (2021). *Market Design*. NBER Working Paper. Working Paper 29367. Available at https://www.nber.org/system/files/working_papers/w29367/w29367.pdf, Accessed on June 7, 2024; *See* also "Market design, by contrast, does not take markets as given; instead, it combines insights from economic and game theory together with common sense and lessons learned from empirical work and experimental analysis to aid in the design and implementation of actual markets." *See* Vulkan N., Roth A.E., and Neeman Z. *The Handbook of Market Design*. Introduction. Oxford University Press, 2013. Available at https://doi.org/10.1093/acprof:oso/9780199570515.001.0001.

[8] The traditional definition of a market failure is when a market does not allocate resources efficiently. *See* Mankiw G.N., *Principles of Economics*, Cengage Press, 2015, p. 150, Chapter 7: "Market power and externalities are examples of a general phenomenon called *market failure*-the inability of some unregulated markets to allocate resources efficiently. When markets fail, public policy can potentially remedy the problem and increase economic efficiency. Microeconomists devote much effort to studying when market failure is likely and what sorts of policies are best at correcting market failures."

[9] Alvin Roth and Lloyd Shapley received the 2012 Nobel Prize in Economics Sciences for "for the theory of stable allocations and the practice of market design." "The Prize in Economic Sciences 2012." Nobel Prize Outreach AB 2024. (Jun 6. 2024). Accessed on June 4, 2024. Available at https://www.nobelprize.org/prizes/economic-sciences/2012/summary/

[10] Roth, A. E. 2018. *Marketplaces, Markets, and Market Design*. American Economic Review, 108 (7): 1609-58.

[11] A feasible assignment is optimal (efficient) if it maximizes the total payoff available the players in the game, which is the gains from trade from pairing a buyer and a seller. *See* Roth, A. E., and M. Sotomayor. Two-Sided Matching: A Study in Game-Theoretic Modeling and Analysis. Econometric Society Monographs. Cambridge University Press, 1990. Chapter 2 for details on the optimal assignment problem in matching games.

with the match is $4. If a marketplace matches buyer 1 to the seller rather than buyer 2, it generates an inefficient match. Poor marketplace design can impede marketplace efficiency.

35. I have spent most of my career researching and designing matching marketplaces to produce efficient and other desirable outcomes. This work includes studying and proposing centralized mechanisms for student assignment to schools, cadets to military posts or "branches," and medical residents to their first internships. For example, in Pathak and Sönmez (2013), with my co-author, I develop a method to measure the extent to which different market-clearing mechanisms encourage straightforward behavior by participants. I apply this method to analyze the extent to which participants have incentives to behave honestly across different centralized matching and auction systems.[12]

36. Market design frameworks and techniques have been used to analyze many real-life marketplaces, such as centralized school choice systems,[13] college admissions,[14] organ donation and exchange systems,[15] medical residency clearinghouses,[16] military personnel job assignment,[17] and other labor markets.[18] Market design tools and principles have also been used to analyze online markets, including auctions in online marketplaces like Amazon and eBay,[19] and online advertising.[20] While these markets may seem different from one another, the goal of each is to facilitate matches; economics, therefore, refers to them as "matching markets" or "matching marketplaces."

37. The exchange market for display advertising is a matching marketplace. Advertisers wish to be matched with users who visit publisher websites. Publishers wish to be matched with advertisers who are willing to pay the most for their inventory at a commensurate level of

[12] Pathak, P. A., & Sönmez, T. (2013). *School admissions reform in Chicago and England: Comparing mechanisms by their vulnerability to manipulation.* American Economic Review, 103(1), 80-106.

[13] Abdulkadiroğlu, A., & Sönmez, T. (2003). *School Choice: A Mechanism Design Approach*. American Economic Review, 93: 729-747.

[14] Gale, D., and Shapley, L. (1962). *College Admissions and the Stability of Marriage*. American Mathematical Monthly, 69: 9-15.

[15] Roth, A.E., & Sönmez, T., and Utku Unver, M. (2005*). Pairwise Kidney Exchange. Journal of Economic Theory*, 125(2): 151-188.

[16] Roth, A.E. (1984). *The Evolution of the Labor Market for Medical Interns and Residents: A Case Study in Game Theory*. Journal of Political Economy, 92: 991-1016.

[17] Sönmez, T., and Switzer, T. (2013). *Matching with (Branch-of-Choice) Contracts at the United States Military Academy*. Econometrica, 81(2): 451-488.

[18] Kelso, A.S., Crawford, V. (1982). *Job Matching, Coalition Formation, and Gross Substitutes*. Econometrica, 50: 1483-1504. *See also* Bulow, J., Levin, J. (1982). *Matching and Price Competition*. American Economic Review, 96 (3): 652-668.

[19] Roth, A. E., and Ockenfels, A. (2002). *Last-Minute Bidding and the Rules for Ending Second-Price Auctions*: Evidence from eBay and Amazon. American Economic Review, 92(4): 1093-1103; *See also* Ely, J.C. and Hossain, T. (2009). *Sniping and Squatting in Auction Markets*. American Economic Journal: Microeconomics, 1(2): 68-94.

[20] Edelman, B., Ostrovsky, M., and Schwarz, M. (2007*). Internet Advertising and the Generalized Second Price Auction: Selling Billions of Dollars of Keywords*. American Economic Review, 97(1): 242-259.

quality.[21] As a result, the insights and principles from market design research on matching marketplaces are relevant to the analysis of Google's conduct.

38. After participants are matched together in a marketplace, a marketplace must specify their terms of trade, or how the marketplace clears. A common way to determine the terms of trade is through an auction, where bidders submit bids, and the auction procedure determines the winner and how much bidders must pay. The close connection between matching and auction theory makes these two subfields of microeconomics core pillars of the market design field. In the marketplace for display ads, many impressions are traded in auctions held near-instantaneously when a viewer browses a webpage. As a result, auction theory, which I teach as part of my undergraduate and graduate courses, provides the relevant tools to analyze Google's exchange from a market design perspective.

39. Market designers consider the key elements of successful markets.[22] Market design economist Alvin Roth summarizes that "To function properly, markets need to do at least three things:

> 1. They need to provide **thickness**—that is, to bring together a large enough proportion of potential buyers and sellers to produce satisfactory outcomes for both sides of a transaction.
>
> 2. They need to make it **safe** for those who have been brought together to reveal or act on confidential information they may hold. When a good market outcome depends on such disclosure, as it often does, the market must offer participants incentives to reveal some of what they know.

[21] For instance, a publisher may want to block all ads with inappropriate content

[22] *See* Haeringer, G. *Market Design: Auctions and Matching. Chapter 1.3.1 What a Market Needs to Work*. The MIT Press, 2017. pg. 3-4. *See also* Roth, A.E. (2007). *The Art of Designing Markets*. Harvard Business Review. Available at https://hbr.org/2007/10/the-art-of-designing-markets.

I will also use principles from my research on school choice mechanisms. "What really matters are basic issues that market operations in other context would likely be concerned about: straight-forward incentives, transparency, avoiding inefficiency through coordination and well-functioning aftermarkets, and influencing inputs to the design, such as applicant decision-making and the quality of the schools." *See* Pathak P.A. *What Really Matters in Designing School Choice Mechanisms*. In: *Honoré B*, Pakes A, Piazzesi M, Samuelson L, eds. Advances in Economics and Econometrics: Eleventh World Congress. Econometric Society Monographs. Cambridge University Press; 2017:176-214.

> 3. They need to overcome the **congestion** that thickness can bring, by giving market participants enough time—or the means to conduct transactions fast enough—to make satisfactory choices when faced with a variety of alternatives."[23]

40. In my own research, I have found that markets become thick when they encourage **participation**; become safe when participants have **transparency** about the rules of the market and when participants have **straightforward incentives**.[24]

41. When participants use tools to participate in a marketplace, those tools must enable the market design principles above in order to support a well-functioning marketplace.

A. Well-designed markets seek to maximize marketplace efficiency

42. Economics, in general, concerns itself with the allocation of scarce resources. In marketplaces, sellers and buyers come together to trade goods or services. When a trade occurs, both parties must find it beneficial for themselves.[25] More specifically, the seller must expect to receive more than their value (or cost) for the good or service they are providing, and the buyer must value the good or service they are acquiring more than the price they pay. These benefits are called "gains from trade" or "surplus" for each party. An efficient match maximizes the gains from trade between the buyer and the seller. Marketplace efficiency means that the goods and services offered in a market end up in the hands of the participants who value them the most.[26] For instance, publishers want to sell their inventory to advertisers with the highest willingness to pay. Welfare can be defined as the sum of the surplus or the sum of all gains from trade in a given marketplace. The efficient outcome is the one that maximizes welfare.

43. One of the main aims of market design research is to identify and propose rules and structures for markets that lead to more efficient outcomes. To this end, market designers try to develop improvements to the structures within markets that might hinder marketplace efficiency and

[23] Roth, A.E. (2007). *The Art of Designing Markets*. *Harvard Business Review*. Available at https://hbr.org/2007/10/the-art-of-designing-markets.

[24] Pathak P.A. *What Really Matters in Designing School Choice Mechanisms*. In: *Honoré B*, Pakes A, Piazzesi M, Samuelson L, eds. Advances in Economics and Econometrics: Eleventh World Congress. Econometric Society Monographs. Cambridge University Press; 2017:176-214.

[25] This is also called "individual rationality" in the economic literature. Absent coercion, if a rational person freely agrees to trade, they must find it beneficial. See Krishna, V. (2010). Auction Theory. Academic Press. Chapter 5.

[26] Maskin, E. (2003). *Auctions and efficiency*. In: Dewatripont, M., Hansen, L., Turnovsky, S. Advances in Economic Theory (invited lectures from the 8th World Congress of the Econometric Society). Cambridge University Press; 2003. pp. 1-24.

thus harm market participants by not fully capturing the gains from trade. A poorly designed market can lead to inefficient allocations, whether directly or through the effects of market participants' incentives.[27] This inefficiency results directly from the market design. Returning to our example with a seller with a cost of $1, buyer 1 with a willingness to pay of $3, and buyer 2 with a willingness to pay of $5, if the marketplace rules pair buyer 1 with the seller instead of buyer 2, then these rules result in an inefficient outcome. An alternative would seek to pair together the buyer and the seller who have the largest surplus. Next, suppose that willingness to pay of buyer 1 and buyer 2 is not publicly known, and the marketplace rules do not encourage buyer 1 and buyer 2 to honestly reveal their willingness to pay. In this case, inefficient matches may arise because the marketplace cannot determine that it is better to match buyer 1 with the seller than buyer 2 because of the incentives for buyers.

44. In the context of marketplaces with **auctions**, marketplace efficiency is achieved when (a) for any seller who is looking to auction off their item, the buyer with the highest willingness to pay for that item wins the auction and (b) for any buyer who is looking to purchase an item, they purchase the item they value the most. In both cases, the seller must prefer to receive the winning price for the item, according to the auction rules, to the seller's next best alternative. If there is no buyer willing to pay more than the seller's best alternative use of the item, then it is efficient for the item to go unsold and for the item to be left with the seller. For example, in the context of display advertising, it may be better for a publisher to use the inventory for their own content, than to sell it to an advertiser at a low price.

45. Sellers and buyers are better off when they can reach a larger set of interested trading partners. The higher the number of bidders, the higher the probability that the potential buyer with highest valuation wins the item; in other words, the marketplace efficiency in auction markets increases as the number of participants increase. McAfee and McMillan's (1987) survey of auction theory states that more bidders in the auction increase the seller's revenue because more bidders increase the average valuation of the winning bidder.[28] Correspondingly, marketplace efficiency typically improves when there are minimal barriers preventing buyers from participating in

[27] Agarwal, N. and Budish, E. (2021). *Market Design*. NBER Working Paper. Working Paper 29367. Available at https://www.nber.org/system/files/working_papers/w29367/w29367.pdf, accessed on June 7, 2024.

[28] McAfee, R.P., and McMillan, J. (1987), *Auctions and Bidding*. Journal of Economic Literature, 25(2), 699-738, page 711.

auctions.[29] Thus, a well-designed auction marketplace reduces barriers to entry for bidders into auctions, improving sellers' prospects of matching with a higher-paying buyer. Similarly, an efficient marketplace should allow buyers to bid on all the items they want. If more items are available to buyers, then it is more likely that buyers can find the item they value the most.

46. In the context of display advertising, marketplace efficiency is increased when publishers can sell their available impressions to the advertisers who value their impressions the most and when advertisers can purchase the impressions they value the most, assuming that publishers are willing to sell at the offered price. In this respect, the ad exchanges can be thought of as a matching marketplace, because the result of an auction is a matched pair of advertiser and publisher (and as an extension of the publisher, a viewer of the webpage). An efficient match in such a case maximizes gains from trade.

47. Both price and quality of advertisements are relevant factors to maximizing marketplace efficiency for publishers and advertisers transacting display ads. A publisher's valuation for their inventory depends on the experience of their customers seeing the ad. For example, if the winning ad is deemed harmful by the publisher because it negatively affects user experience, this decreases the publisher's valuation from the auction. Hence, a publisher's surplus or gains from selling an ad (and hence the analysis of marketplace efficiency) must incorporate the user experience and the ad auction revenue. Likewise, advertisers care about where their advertisements are shown. An advertiser may want to avoid being placed next to inappropriate content and having users develop a negative view of the advertiser.[30]

48. In display advertising, marketplace inefficiency can harm publishers, advertisers, or both. The efficient allocation is achieved when the gains from trade are maximized, entailing both that (a) a publisher is able to trade with the buyer with the highest value, while maintaining a commensurate level of quality, and (b) an advertiser is able to identify and buy the item they value the most. Distortions to either of these lead to a reduction in publisher or advertiser payoffs.

[29] Note: Tools such as reserve prices would not be barriers that would prevent buyers from participating in auctions. A high reserve price may ensure that some advertisers do not win an auction but would not preclude them from participating.

[30] "Brand Safety solutions enable a brand to avoid content that is generally considered to be inappropriate for any advertising, and unfit for publisher monetization regardless of the advertisement or brand." "Understanding Brand Safety & Brand Suitability in a Contemporary Media Landscape The Best Practices Guide to Concepts, Definitions, Tools, and Transactional Applications" IAB, December 2020, available at https://www.iab.com/wp-content/uploads/2020/12/IAB_Brand_Safety_and_Suitability_Guide_2020-12.pdf, Accessed June 7, 2024.

49. Furthermore, competition can improve marketplace efficiency. As I discuss in Section X, when multiple exchanges compete for publisher inventory, publishers increase their likelihood of finding an advertiser with the highest willingness to pay, which increases publisher revenue. Likewise, when advertisers have access to multiple exchanges, they increase the likelihood of finding a publisher with relevant inventory for their advertisement.

B. Markets become thick by encouraging participation

50. A well-designed marketplace should bring together many participants who want to transact to facilitate the highest quality matches between buyers and sellers and generate the highest total surplus for participants. Alvin Roth describes markets with many buyers and sellers *as thick* marketplaces.[31] In thick marketplaces, a seller is more likely to find a match to a buyer who wishes to transact, and more likely to sell at a higher price if multiple buyers compete to purchase what the seller is offering. Likewise, buyers benefit from thick markets because they are more likely to find a seller who is an attractive trading partner.

51. In display advertising, publishers have tools to maximize their revenues. As I discussed above, when publishers have access to multiple sources of demand, they can increase their revenues. Publishers can also maximize revenue and protect against low quality ads by using reserve prices, as I discuss in Section XI. Limiting the number of participants of the marketplace on either the publisher side or the advertiser side leads to a *thinner* marketplace, which results in decreased advertiser and publisher surplus.

52. As I discuss in Section IX-Section X, Google has reduced the ability for publishers and advertisers to participate in auctions on competitor exchanges. Google leverages its DFP ad server to steer impressions to AdX over rival exchanges. Google also limits where Google Ads advertisers can participate by keeping Google Ads advertisers exclusive to AdX.

[31] Roth, A.E. (2007). *The Art of Designing Markets*. Harvard Business Review. Available at https://hbr.org/2007/10/the-art-of-designing-markets.

C. Markets are safer when they ensure transparency and fairness

53. Transparency is the ability of market participants to understand the rules of the marketplace.[32] Transparency improves participants' ability to make choices and have enough information about how the market works to make well-informed decisions. Transparency ensures the participants are safe to reveal their information such as their willingness to pay without being worse off for disclosing.[33] This aspect of market design is particularly important where there is a centralized process (such as an auction or clearinghouse) where both buyers and sellers must trust the operator of that process. Transparency requires that participants are informed of changes to the rules or operations of the process including, for example, modifications to algorithms within existing centralized processes. Transparency and the ability to explain the process were among the motivations that led policymakers to reform the centralized matching systems of Boston and NYC school districts.[34]

54. Market participants need to know the rules of the market to make the best choices. In addition, participants need enough information to measure outcomes and make decisions in the future. Participants who are less informed about the process will likely obtain worse outcomes than the participants who are more informed. Absence of a transparent design can be exploited by a faction of participants as well.[35] Transparency is a solution that makes information available to less informed participants.

55. In display advertising, auction rules affect how publishers set reserve prices and how advertisers set their bids. If auction rules are not transparent and change without publisher and advertiser knowledge, both parties may make decisions that are not in their best interest.

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[32] Pathak P.A. *What Really Matters in Designing School Choice Mechanisms*. In: *Honoré B*, Pakes A, Piazzesi M, Samuelson L, eds. Advances in Economics and Econometrics: Eleventh World Congress. Econometric Society Monographs. Cambridge University Press; 2017:176-214.

[33] "Well-designed matching process account the fact that participants are making strategic decisions. Sometimes the goal of the market designer is to reduce the need to game the system, allowing choosers to concentrate on identifying their true needs and desires. Other times the goal is to ensure that even if some gaming is inevitable, the market can still work clearly. A good marketplace makes participation *safe* and *simple*." Roth, A.E., *Who gets what and why: the new economics of match making and market design*, Houghton Mifflin Harcourt, 2015, at p. 11.

[34] Abdulkadiroglu, A., Pathak P. A., and Roth A. E. (2009). *Strategy-proofness versus Efficiency in Matching with Indifferences: Redesigning the New York City High School Match*. American Economic Review, 99(5), 1954–1978.

[35] Pathak, P. A. *What Really Matters in Designing School Choice Mechanisms.* Chapter 6 in Advances in Economics and Econometrics: Eleventh World Congress, edited by Bo Honoré, Ariel Pakes, Monika Piazzesi, and Larry Samuelson, 176–214. Econometric Society Monographs. Cambridge: Cambridge University Press, 2017.

56. As I explain in Section XII, Google's conduct has distorted information available to advertisers and publishers, affecting their decision-making. For example, Project Bernanke and related programs provide a mechanism that is opaque to the outside market and difficult to detect. Bernanke effectively increased GDN's top bid into AdX beyond the advertiser's willingness to pay for some auctions. If advertisers were aware of Project Bernanke, they could optimize their bidding strategies accordingly. Without this information, since the auction was distorted, advertisers willing to pay more for the impression could be left out, resulting in an allocation that does not satisfy the fundamental concept of fairness.

57. Fairness or ensuring that there is a level playing field so that all participants can participate on the same terms is also an important goal of market design. These considerations were paramount in my work studying and advising Boston on its centralized matching system for student assignment.[36] Sophisticated participants with access to more information and advice were more able to strategically "game the system" and obtain better outcomes over less sophisticated participants who did not have access to the same information about marketplace rules. This undermined trust with the marketplace operator and ultimately led to a major reform.

58. Google has also discussed the importance of having a fair marketplace as relevant in display advertising. As part of its "Last Look" information advantage, Google recognized it gave its exchange, AdX, an advantage over other exchanges.[37] Removing Last Look would create a "level playing field for all exchanges."[38] I discuss Last Look further in Section X.

D. Marketplaces are also safer when they have straightforward incentives and reduce conflicts of interest

59. Creating straightforward incentives is a fundamental objective in market design.[39] Market designers aim to set up markets such that participants cannot improve their outcome by attempts at strategic manipulation or gaming the system, such as stating preferences other than

[36] Pathak, P.A., and Sönmez, T. (2008). *Leveling the Playing Field: Sincere and Sophisticated Players in the Boston Mechanism*. American Economic Review, 98(4), pp.1636-52.

[37] "Currently, AdX has an advantage where its closing price can depend on bid from another exchange." GOOG-AT-MDL-013293467 at-467. Dec. 5, 2016. "Proposal: Jedi No Last Look" - Internal Google document.

[38] "Primary benefit of giving up last look is creating a level playing field for all exchanges including AdX in Jedi." GOOG-AT-MDL-013293467 at-467. Dec. 5, 2016. "Proposal: Jedi No Last Look" - Internal Google document.

[39] Pathak, P. A. *What Really Matters in Designing School Choice Mechanisms*. Chapter 6 in Advances in Economics and Econometrics: Eleventh World Congress, edited by Bo Honoré, Ariel Pakes, Monika Piazzesi, and Larry Samuelson, 176–214. Econometric Society Monographs. Cambridge: Cambridge University Press, 2017.

their true preferences or bidding differently from their true values. Rather, market designers aim to design systems that incentivize participants to reveal their true preferences in matching marketplaces and bid their true valuations in auctions.

60. Roth (2018)[40] describes this desire for straightforward incentives as a fundamental principle of market design, stating that well-functioning marketplaces "need to make it safe for those who have been brought together to reveal or act on confidential information they may hold. When a good market outcome depends on such disclosure, as it often does, the market must offer participants incentives to reveal some of what they know." In this way, a transparent marketplace with rules that create straightforward incentives helps participants understand how best to transact in the marketplace.

61. Preventing conflicts of interest is relevant to efficiency in financial marketplaces. For example, investment advisers are typically compensated based on a percentage of assets under their management and have an incentive to make investment recommendations to maximize their own gain instead of recommending the best investment decisions for their clients' objective. To address this conflict of interest, the SEC requires investment advisers to have a fiduciary duty to their clients, not put their interests above those of their clients, and disclose conflicts of interest in a timely manner. [41]

62. Conflicts of interest lead to worse outcomes for participants and resolving conflicts of interest improves outcomes for participants. My work on residential brokerage markets shows evidence that conflicts of interest in the compensation of real-estate agents and brokers leads to worse matches of home buyers and sellers.[42] In the residential real estate market, buyers in the United States have historically not paid commissions to their agents. Instead, sellers make upfront offers of compensation to buyer agents. The market structure introduces an inherent conflict of interest: because buyer agents can see which properties offer high commissions, they are incentivized to "steer" their clients to properties that lead to the highest payout for the agent but

[40] Roth, A. E. (2018). *Marketplaces, Markets, and Market Design*. American Economic Review, 108 (7): 1609-58.

[41] "As an investment adviser, you are a "fiduciary" to your advisory clients. This means that you have a fundamental obligation to act in the best interests of your clients and to provide investment advice in your clients' best interests. [...] You must eliminate, or at least disclose, all conflicts of interest that might incline you — consciously or unconsciously — to render advice that is not disinterested. If you do not avoid a conflict of interest that could impact the impartiality of your advice, you must make full and frank disclosure of the conflict." *See* U.S. Securities and Exchange Commission. "Information for Newly-Registered Investment Advisers" (November 23, 2010). Accessed on June 4, 2024. Available at https://www.sec.gov/divisions/investment/advoverview.htm

[42] Barwick, P.J., Pathak P.A., and Wong, M. (2017). *Conflicts of Interest and Steering in Residential Brokerage*. American Economic Journal: Applied Economics, 9 (3): 191-222.

may not be the best match for the buyer.[43] The conflict of interest can be resolved by removing the upfront offer of compensation, because then buyer agents have no incentive to steer their clients to properties that are poor matches for their buyers, but with high offers of compensation.

63. It is my understanding that Professor Gans has found Google to have a dominant market position in multiple relevant antitrust markets within the "Ad Tech Stack."[44] In this report, I establish that Google's positions create an incentive for Google to act on conflicting interests and use its ad server tool and ad buying tool to the benefit of its exchange, and vice versa.

E. Relevant Auction Concepts

64. As part of my analysis, I will also rely on relevant auction concepts. Here, I describe the relevance of auction rules and reserve prices.

1) Auction Formats and Rules

65. Auctions are one of the common ways buyers and sellers interact to trade goods. In a matching market, auctions are often used to arrive at a market-clearing price. In auctions, sellers collect bids for the item they wish to sell, and then pick a winner and price based on predetermined rules of the auction.[45] In many settings, a centralized and neutral third-party (such as an auction company or clearinghouse) acts on behalf of the seller to collect bids and apply the auction rules to determine the winning bidder and clearing price.

66. Auction theory is a multidisciplinary branch of economics, computer science, operations research, and applied mathematics. The field analyzes auctions, their features--such as their design rules or parameters--and the implications of these features on participant behavior and auction outcomes. Market designers consider auction theory to be a discipline within market design concerned specifically with markets in which auctions take place.

[43] The upfront rule of compensation was at the heart of recent antitrust litigation against the National Association of Realtors for price-fixing. *See* The Wall Street Journal. "A Big Legal Defeat for the Realtors." (October 31, 2023). Accessed on June 4, 2024. Available at https://www.wsj.com/articles/burnett-v-national-association-of-realtors-lawsuit-real-estate-home-buyers-sellers-8c6466dd

[44] Discussion with Professor Gans, June 6, 2024.

[45] This work can also be undertaken by third-party entities like clearing houses, especially in large markets. Ad exchanges are one examples of such clearing houses.

67. The rules of an auction, or the auction procedures, determine (a) which bidder is going to be awarded the item and (b) how much the bidder awarded the item will pay in the auction.[46] Auction theory considers many different auction procedures, but the two most relevant to the case are first-price and second-price auctions.

68. Under a first-price auction, the item is awarded to the bidder who submitted the highest bid with the winner paying their bid (i.e., the highest submitted bid) for the item. Under a second-price auction, the item is awarded to the bidder who submitted the highest bid, just like the first-price auction procedure. But with second-price auctions, the winner pays the second-highest submitted bid for the item. This change in payment rule is the main distinction between the first- and second-price auction procedures. Vickrey (1961), Myerson (1981), Riley and Samuelson (1981), and Milgrom and Weber (1982) provide analyses and comparison of first- and second-price auctions under different assumptions about bidder valuations and behavior.

69. To illustrate the difference in payment rules between the first- and second-price auction procedures, imagine an auction where the bidders submit $10, $6, and $2 as their bids. In a first-price auction, the bidder with the $10 bid wins the auction and pays $10 to the seller. Under a second-price auction, the bidder with the $10 bid wins the auction, but this time pays the second-highest bid, which is $6.

70. This difference in payment rule leads to distinct properties for the two procedures. For example, in the second-price auction, the bidders are incentivized to submit their actual value for the auctioned item as their bid.[47] This is because bidding less than the actual value does not change the payment to be made in the case of a win but decreases the probability of a win. However, in the case of a first-price auction, bidding below the actual value decreases the payment to be made in the case of a win. In general, the first-price auction format does not incentivize bidders to submit their true values as their bids.

[46] Auction procedures can and do admit many other considerations as well, such as whether the bid submission is 'sealed' or public (display ad auctions are sealed bid auctions, meaning the bidders do not learn about each other's bids), or whether all bidders submit their bids at the same time or according to a specific order (display ad auctions are simultaneous auctions, meaning all bidders submit their bids at the same time). However, the two tasks I mentioned are the most relevant ones to this case.

[47] This property is called "strategyproofness" and "truthfulness" in the auction literature. More specifically, an auction procedure is truthful if submitting their true values for the auctioned item as their bids is the best strategy for the bidders. For further information, *see* Vickrey, W. (1961). *Counterspeculation, Auctions, and Competitive Sealed Tenders*. The Journal of Finance, 16(1), 8–37. Available at https://doi.org/10.2307/2977633.

2) Reserve Prices

71. A reserve price is a price set by sellers which is the minimum price required to sell the item. If no bidder bids higher than the seller's reserve price, the item is not sold. In a second-price auction, the reserve price can become the clearing price if the highest bidder bids above the reserve price and the second highest bid is below the reserve price.

72. Sellers set reserve prices to maximize their revenue, but they can also use reserve prices for additional objectives depending on the auction context. Literature on auction theory, including Myerson (1981) and Riley and Samuelson (1981), analyzes how auctions should be designed to generate the highest seller revenues. This research shows setting reserve prices optimally allows sellers to maximize revenue. A higher reserve price leads to (a) a higher clearing price if the good is sold but also (b) a lower probability of the good being sold. Hence, the optimal reserve price involves tradeoffs between these two factors. In the context of display advertising, reserve prices can be a useful tool for publishers who want to block an advertiser from purchasing their impression because they may not want a visual from that advertiser appearing on their website. They can achieve this by setting a relatively high floor for that advertiser or a relatively high reserve price for an exchange known to transact low-quality ads.

73. Reserve prices can also convey information on the quality of the item being sold. When bidders are unsure about an item's quality, Cai, Riley, and Ye (2007) show that the seller can use the reserve price to signal the item's quality.[48] When a reserve price is higher, bidders may infer that the auctioned item has higher quality because the seller risks the item going unsold by setting a high reserve. In the context of display advertising, a publisher can signal that a new impression is of high value by setting a high reserve price. A high reserve price can signal to the advertisers that the publisher thinks either (a) they can find an advertiser from another demand source who is willing to pay at least the reserve price amount for this impression or (b) their own valuation of the impression is equivalent to at least the reserve price, to display their own "house ads."[49] This, in turn, informs advertisers that this impression has a high value, and so the advertiser needs to

[48] Cai, H., Riley, J., & Ye, L. (2007). *Reserve price signaling*. Journal of Economic Theory, *135*(1), 253-268

[49] House ads are used by publishers to promote their own products or services. As a result, they do not generate ad revenue, but can create revenue from the sale of products or services. For example, the Houston Chronicle can utilize house ads to advertise its subscription service. For Google documentation on house ads, *see* Google Ad Manager Help. "House line items". Accessed on June 4, 2024. https://support.google.com/admanager/answer/79305?hl=en.

bid relatively high, not just to clear the reserve price, but also to beat the competition for the impression.

74. It may be, at first, counterintuitive that a reserve price increases a seller's expected revenue because if bidders bid less than the reserve price, a sale does not take place. A reserve price reduces the number of items sold because it reduces the probability that any one item is sold. But the benefit of this reduction in items sold is that bids are higher when there is a sale. I illustrate this simple force in my undergraduate class through the following example.

75. Suppose we consider a second-price auction in which the highest bidder wins the item and pays the second-highest bid. Suppose that Ann is the only bidder, with a valuation between 0 and 1 that is randomly chosen (and has an equal probability of being any value between 0 and 1, i.e., is "uniformly distributed," a standard way to evaluate these problems). With a reserve price, since there is only one bidder, the reserve price is effectively the second highest bid, provided that Ann bids more than the reserve price; otherwise, there is no sale. The seller's optimal reserve price is ½ and not 0, since that is the value that maximizes seller's revenue.[50] The same basic force applies when there are multiple bidders: the seller's revenue is maximized with a positive reserve price, given our assumptions. This simple example illustrates why the seller's expected revenue is higher with a reserve price than without one. The reserve price allows the seller to restrict the probability of sale (the "quantity") to fetch a higher price.

VII. OVERVIEW OF DISPLAY ADVERTISING AND PARTICIPANTS

76. Display advertising tools connect advertisers that seek to promote their products, services, or brands with publishers of websites on which advertisements are displayed. To contextualize my analysis of display advertising, in this section, I explain the main participants in display advertising, their goals, and their relationships with one another. This discussion includes publishers, advertisers, and businesses that provide products and services relating to display advertising. Defining antitrust markets is outside the scope of my assignment, and so,

[50] Suppose the reserve price is "R" between 0 and 1. The seller's expected revenue is given by the product of Ann's probability of winning the auction, given by 1-R because it is the probability that Ann's value is greater than R and Ann's value is uniformly distributed, and the price Ann must pay when she wins. The price Ann pays if she wins is the reserve price (R) because there is only one bidder, so the second highest bid is the reserve price. The seller's revenue is then given by (1-R) x R. Seller revenue is maximized when the reserve price is positive, specifically at R=1/2, and not when R=0.

throughout this section and the remainder of my analysis, I rely on the antitrust market definitions from Professor Gans.

77. Figure 1 below provides an overview of Google's tools in the display ads landscape.[51]

Figure 1: Display Ads Landscape, 2016

A. Overview of Digital Publishers

78. Digital publishers own websites and may use display advertising to monetize web traffic on their webpages. For example, a cooking blog may generate revenue by displaying advertisements that appear on its webpages containing recipes. In display advertising, a publisher aims to maximize revenue while maintaining a commensurate level of quality for its website.[52] To achieve this goal, publishers create relationships with advertisers both directly and indirectly via display advertising exchanges.

[51] The supply and demand flows in the display ads landscape was mapped out by Google in an internal document. GOOG-NE-04579093 at -101. Sept. 27, 2016. "Google Display + Video Ads Business Overview" - Internal Google presentation by [redacted].

[52] An internal presentation describes that publishers want: [redacted] GOOG-AT-MDL-015238842 at-846. Oct. 2019. "DoubleClick Ad Exchange" - [redacted] - DoubleClick Ad Exchange - Internal Google Presentation.

79. Publishers may contract directly with advertisers through "direct deals" in which the two parties agree to an outcome of interest to the advertiser (*e.g.*, the number of clicks from website visitors) sold at a specific price and associated total spending amount.[53] To facilitate "direct deals," a publisher may employ sales teams that cultivate relationships with advertisers and negotiate agreements.

80. Publishers also may contract with exchanges to sell display advertisements through private or open auctions.[54] In such cases, a publisher would use the exchange(s) to act as matchmaker(s) with advertisers and facilitate reaching terms for displaying ads on the publisher's website (i.e., outcomes of interest, purchase quantities, prices).[55] Publishers contract with an exchange to offer their inventory for sale through that exchange. These contracts stipulate revenue sharing terms between the publisher and the exchange, in which the exchange takes as payment a portion of the revenue generated from selling the publisher's inventory. It is my understanding that Google's AdX exchange currently has a share of approximately 55% within the Ad Exchange Market.[56] In addition to Google's AdX, there are other display advertising exchanges including AppNexus/Xandr (owned by Microsoft), Index Exchange, Magnite (formerly Rubicon), OpenX, Pubmatic.[57]

81. Publishers use ad servers to manage their relationships with (and flow of inventory to) advertisers and exchanges.[58] Publishers offer their inventory for sale through technical steps which require

[53] "Publishers typically use different selling strategies for the different types of inventory. For extremely exclusive inventory, such as a publisher's homepage, where a publisher wants full control over the ads that appear alongside their most valuable content, a publisher will typically sell this inventory directly to buyers for an agreed upon number of impressions, date-range, and price. On the other end of the spectrum, publishers may have inventory that has gone unsold. For this inventory, publishers may be willing to forego some level of control over the ads that appear in order to sell the inventory. In situations like this, publishers would make this inventory available for sale in an open auction using a sell-side platform (SSP) such as DoubleClick Ad Exchange for thousands of advertisers to bid on." See Think with Google. "The Buyer's Guide to Programmatic Direct." Google Whitepaper (July 1, 2016). Accessed on June 4, 2024. Available at https://www.thinkwithgoogle.com/intl/en-apac/marketing-strategies/automation/buyers-guide-programmatic-direct/

[54] Open auctions and private auction were deal types available to publishers to sell digital advertising inventory. *See* GOOG-AT-MDL-014349706 at-712. June 2020. "Programmatic Direct - Competitor Intelligence" - Internal Google presentation; *See also* Think with Google. "The Buyer's Guide to Programmatic Direct." (July 1, 2016). Accessed on June 4, 2024. Available at https://www.thinkwithgoogle.com/intl/en-apac/marketing-strategies/automation/buyers-guide-programmatic-direct/

[55] "(Ad) Exchange is an online, auction-driven marketplace where ad impressions are sold and bought in real time.

Publishers can place exchange tags on their websites, which will send ad requests to the exchange with every impression.

Bidders can bid for each impression - how much they want to pay and what ad they want to display.

Exchange selects the winner and displays the ad." GOOG-AT-MDL-001004706 at-708. June 2019. "Ad Manager Ecosystem 101" - Internal Google presentation by [redacted]

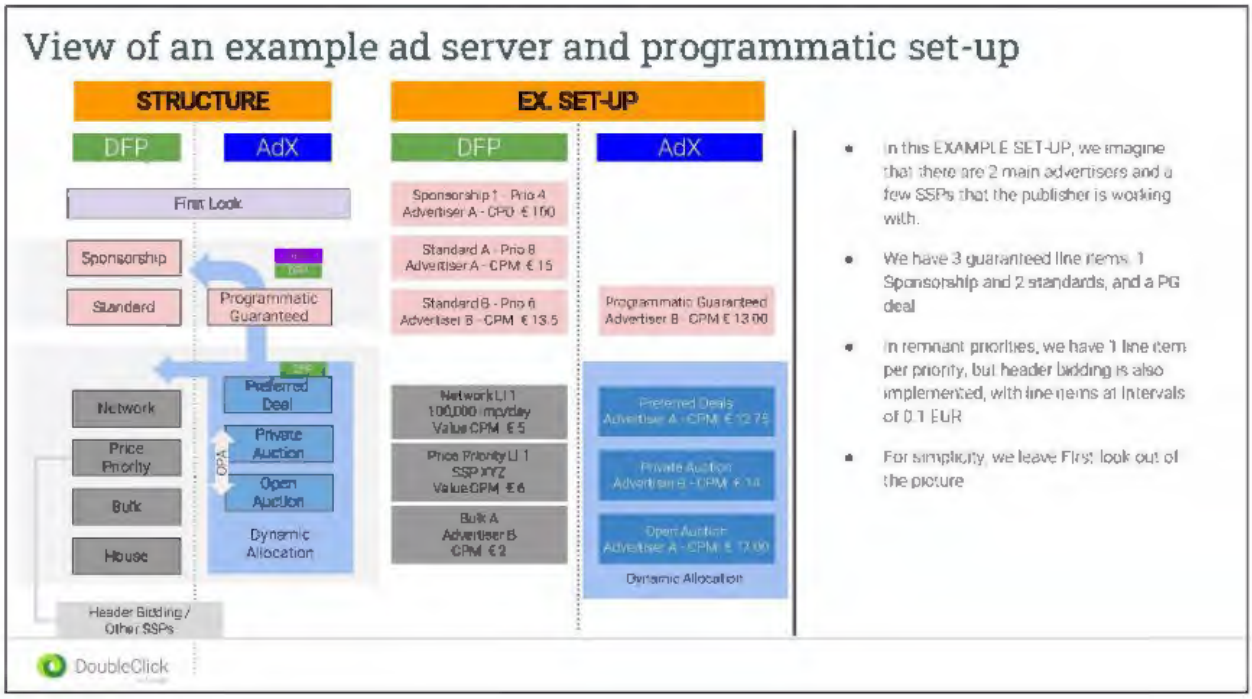
[56] Discussion with Professor Gans on June 6, 2024.

[57] Discussion with Professor Gans on June 6, 2024

[58] "Ad Server is a tool that lets publishers: Decide where on their pages ads run, Create and manage campaigns, Target campaigns to certain users or places. Traditionally there is direct relationship between advertisers and publishers, campaign assets are sent over via email and all configuration is done in the publisher's ad server based on a signed order form." GOOG-AT-MDL-001004706 at-707. June 2019. "Ad Manager Ecosystem 101" - Internal Google presentation by [redacted]

them to create "line items" in the ad server that correspond to the advertisers and exchanges with which the publisher contracts.[59] These line items are technical settings from the publisher that can be used to reflect the value of direct deals with advertisers or the reserve prices a publisher sets for an exchange. When a user visits a publisher's website, the publisher ad server will match this user to a relevant ad.[60] The publisher ad server then determines which ads to serve to that user based on available line items, which represent demand from direct deals with advertisers or from ad exchanges, the details of this process are further described in Figure 2.[61]

Figure 2: Example Ad Serving Process Flow with Line Items



[59] "Line Items represent campaigns / campaign elements within AdManager. There is a structure of objects within AdManager that lets you define your campaigns, but Line Items are the unit at which AdManager delivery operates on.
GOOG-AT-MDL-001004706 at-719. June 2019. "Ad Manager Ecosystem 101" - Internal Google presentation by [redacted]

[60] "Ad Manager's ad selection process is designed to deliver the right ad to the right customer at the right time. Below is the process that Ad Manager follows to select an ad to serve: A user's web browser or mobile device loads an Ad Manager ad tag (on a site) or Ad Manager ad code (in an app) and triggers an ad request, which passes information to the ad server." Google Ad Manager Help. "Ad selection white paper." Accessed on June 4, 2024. Available at https://support.google.com/admanager/answer/1143651#overview_of_the_ad_selection_process

[61] "Once the ad server gathers the relevant information for the ad request, it generates a list of all line items and yield groups that match a subset of the targeting criteria of the request." Google Ad Manager Help. "Ad selection white paper." Accessed on June 4, 2024. Available at https://support.google.com/admanager/answer/1143651#overview_of_the_ad_selection_process
GOOG-AT-MDL-000993446 at-454. Feb. 2018. "[redacted] - Internal Google presentation by Stefania Montagna. DRX is another term for DFP and AdX. (bottom) GOOG-AT-MDL-001004706 at-722. June 2019. "Ad Manager Ecosystem 101" - Internal Google presentation by [redacted]

B. Overview of Digital Advertisers

82. Advertisers seek to optimize the return generated by the display advertisements they purchase and show to web users.[62] [63] Advertisers seek to spend their allocated display advertising budgets in the most efficient manner, with goals such as maximizing the number of people that see their ad (referred to as reach), maximizing the number of viewers that click on their ad, or displaying ads to web users that meet a specific targeting profile.[64] Advertisers may purchase directly from publishers (i.e., direct deals), through ad buying tools, or work with an agency to facilitate purchases.[65]

83. Advertisers may use ad buying tools to place bids on inventory sold through exchanges.[66] Ad buying tools offer functionalities including managing campaigns, setting targeting criteria on which users to reach, and budget management.[67] Ad buying tools available to small advertisers offer more limited functionality, allowing advertisers to set targeting criteria and budgets, while

[62] "GDN Advertisers – Mostly direct response, focused on sales ("conversions") at good ROI." GOOG-DOJ-03151263 at-266. "DBM Optimization" - Internal Google presentation aimed at new employes (go/dbm-bidding-noogler-class) by [redacted]

[63] "[redacted]

[64] "While Google Ads search ads show up to potential customers the moment that they start looking on Google for what you offer, display ads show up while people are visiting sites across the Google Display Network. So, how do you know if the people seeing your display ad are interested in what you offer?

Google Display Network (GDN) targeting allows you to set where or when your ad is shown based on features of your ideal audience, such as their personal interests, age or gender." Google Ads. "Reach a larger or new audience with Google Display Network targeting." (March 20, 2023). Accessed on June 4, 2024. Available at https://ads.google.com/intl/en_us/home/resources/articles/reach-larger-new-audiences/

[65] An internal Google document maps the flow of demand and supply between the advertiser tools, exchange, and publisher tools. GOOG-AT-MDL-004523197 at -197. Mar. 13, 2018. "Display Ads Landscape" - Internal Google document by [redacted].

"Publishers typically use different selling strategies for the different types of inventory. For extremely exclusive inventory, such as a publisher's homepage, where a publisher wants full control over the ads that appear alongside their most valuable content, a publisher will typically sell this inventory directly to buyers for an agreed upon number of impressions, date-range, and price. On the other end of the spectrum, publishers may have inventory that has gone unsold. For this inventory, publishers may be willing to forego some level of control over the ads that appear in order to sell the inventory. In situations like this, publishers would make this inventory available for sale in an open auction using a sell-side platform (SSP) such as DoubleClick Ad Exchange for thousands of advertisers to bid on." Think with Google. Google whitepaper titled "The Buyer's Guide to Programmatic Direct." (July 1, 2016), at page 6. Accessed on June 4, 2024. Available at https://www.thinkwithgoogle.com/intl/en-apac/marketing-strategies/automation/buyers-guide-programmatic-direct/

[66] "DSPs [Demand Side Platforms – ad buying tools] respond to ad exchange bid requests by sumitting which campaign and for which price they want to show on a given impression." GOOG-AT-MDL-001004706 at-711. June 2019. "Ad Manager Ecosystem 101" - Internal Google presentation by [redacted]

[66] GOOG-AT-MDL-001004706 at-711. June 2019. "Ad Manager Ecosystem 101" - Internal Google presentation by [redacted]

[67] GOOG-AT-MDL-001004706 at-711. June 2019. "Ad Manager Ecosystem 101" - Internal Google presentation by [redacted]

the tool determines the amount to bid on impressions. Ad buying tools that are available to large advertisers offer more functionality, such as allowing advertisers to create custom algorithms that determine how much to bid on available impressions.[68] To use an ad buying tool, the advertiser (regardless of size) must contract with the tool provider and generally pay a commission to the provider for each impression won.[69]

84. Google's Google Ads (formerly known as AdWords) is an ad buying tool available to small advertisers. Other ad buying tools available to small advertisers include Yahoo! Network, Taboola, and Microsoft Advertising.[70]

85. Google's DV360 (formerly known as DBM) is an ad buying tool available to larger advertisers. Other ad buying tools available to large advertisers include the Trade Desk, Criteo, Verizon, and Amazon.[71]

C. Google's Ad Technology Products

1) Google Buying Tools – Google Ads and DV360

86. Google has two ad buying tools – Google Ads, which is for smaller advertisers, and DV360, which is for larger advertisers.[72] Both of these tools charge advertisers a fee based on the percentage of the overall cost of impressions won on the tool.

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[68] "Q: And being a neutral ad buying platform, that means that Google's ad buying tools, like specifically DV360, won't favor, let's say, Google's AdX auction if they are truly neutral, right?
[...]
A: I don't believe I've used the word ""neutral."" And I would say that Display & Video 360 is a platform that gives advertisers the choice to choose which inventory they wish to purchase at cost and that Display & Video 360 will take those settings into account in order to buy the optimal ads based on the advertiser, and that includes giving full control over which inventory you purchase from.
Deposition of [redacted] Google (April 5, 2024) at 146:11-147:4.

[69] "Demand side platforms use a wide range of pricing methods and fee structures which vary according to vendor and client requirements." GOOG-AT-MDL-008569591 at -625. Jan. 2011. "Demand Side Platforms" - Econsultancy Digital Markets United Report.
For instance, Google charges a fee based on advertiser spend for Google Ads and DV360. "How our display buying platforms share revenue with publishers," Google Ad Manager. Sissie Hsaio, Vice President and GM, Apps, Video, and Display Advertising at Google. "How our display buying platforms share revenue with publishers." (June 23, 2020). Accessed on June 4, 2024. Available at https://blog.google/products/admanager/display-buying-share-revenue-publishers/

[70] The advertiser tool for smaller advertisers is called Google Ads. GOOG-AT-MDL-001004706 at-708. June 2019. "Ad Manager Ecosystem 101" - Internal Google presentation by [redacted]
Discussion with Professor Gans on June 6, 2024.

[71] GOOG-AT-MDL-001004706 at-708. June 2019. "Ad Manager Ecosystem 101" - Internal Google presentation by [redacted] Discussion with Professor Gans on June 6, 2024.

[72] "Q: Is there a platform for smaller users? Because I understand that DV360 is more for large customers; is that right?
A: Display & Video 360 is our licensed DSP software, typically is licensed by agencies and sophisticated advertisers with complex marketing campaigns. We also offer the ability to purchase display ads through Google Ads produce which is a product that provides search, displaying, YouTube and video advertisers, and we have customers who use both of those products often simultaneously."

87. The Google Ads[73] tool places bids for advertisers, allowing them to set goals, targeting criteria, and maximum willingness to pay for impressions. The Google Ads tool ultimately selects the bid price for a given impression and does not allow advertisers to determine bid prices directly.[74] Google Ads is exclusive to Google's exchange AdX, except for remarketing impressions.[75] In general Google Ads will only bid in AdX auctions; however Google Ads grants one, limited exception for retargeting impressions available through third-party exchanges via the AwBid program.[76] A remarketing impression is when an advertisers shows ads to customers who have previously visited the advertiser's website.[77] Such cases where Google Ads bids on a third-party exchange account for [redacted][78]

88. DV36[79] is a more complex solution available to larger advertisers that offers greater functionality than Google Ads, including the ability to create custom bidding algorithms and access to third-

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Deposition of [redacted], Google (April 5, 2024) at 149:7-23

[73] Formerly known as AdWords, also referred to as Google Display Network (GDN). The Google Display Network originally was AdWords and AdSense (*see* GOOG-AT-MDL-004523197 at -197), but Google will use "[redacted]

[74] Advertisers can set bidding strategies and have Google Ads execute the bidding, "Display Smart Bidding Guide," Google, available at https://services.google.com/fh/files/misc/gda_smart_bidding_guide.pdf

[75] "[redacted] GOOG-NE-05243813 at-821. Aug 2012. "Display Strategy Working Document" - Internal Google document outlining display strategy and priorities across teams.

[76] "AdWords Cross-Exchange Buying (AWBid) is [redacted] GOOG-DOJ-27759140 at-142. Nov. 2013. "AwBid – OpenX: Cross Exchange Remarketing – Deal Review – November 2013" - Internal Google presentation by [redacted] - Business Development, [redacted] - Product Management, [redacted] - Engineering, [redacted] - Legal, [redacted] - Sales, [redacted] - Finance.

[77] "Remarketing allows you to show ads to customers who have previously visited your website or used your mobile app." Google Ads Help. "About dynamic remarketing: show ads tailored to your site and app visitors." Accessed on June 4, 2024. Available at https://support.google.com/google-ads/answer/3124536?hl=en

[78] As shown in the chart, Google Ads buying on Non-Google Display is [redacted]. GOOG-NE-07290902 at-922. Sept. 2019. "The Display Buyer Story: A deep dive into buying doors, needs, and use-cases" - Internal Google presentation by [redacted] : [redacted], Quant UXR - Google Display Ads, [redacted] Qual UXR - DV360, and [redacted] Quant UXR Intern, Google Display Ads.

[79] Formerly known as DoubleClick Bid Manager (DBM)

party exchanges.[80] Advertisers that are interested in DV360 must work with Google sales teams to purchase services, unlike Google Ads which allows immediate sign up.[81] [82]

2) Publisher Ad Server – DoubleClick for Publishers (DFP)[83]

89. Google's publisher ad server, DFP, is an ad server for large publishers.[84] Publishers sign a contract to license DFP and pay flat fees per 1,000 impressions for ad serving.[85]

90. Publishers can use DFP to connect to multiple exchanges and rank exchanges by priority. Between 2009 and 2016, publishers typically used a "waterfall" approach to sell impressions, under which exchanges were sequentially called and would stop when an exchange offered a price for an impression above the publisher's floor.[86] Publishers would set waterfall priority in DFP based on a static, average bid price of the third-party exchange. One weakness of the waterfall approach is that exchanges ranked lower within the hierarchy of the waterfall may never be called despite potentially having access to demand with a high willingness to pay for that inventory.

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[80] "Work smarter with end-to-end campaign management for enterprises in one tool — from media planning and creative development to measurement and optimization." Display & Video 360, Google Marketing Platform. Accessed on June 4, 2024. Available at https://marketingplatform.google.com/about/display-video-360; "You can use rules to optimize for weighted conversions, clicks, brand awareness, or define your own custom metrics. This improves how custom bidding prioritizes impressions that align with your campaign's objective, without having to write a script." Display & Video 360 Help. "Create and use a custom bidding script." Accessed on June 4, 2024. Available at https://support.google.com/displayvideo/answer/9728993?hl=en

[81] "Talk with an enterprise sales representative to get advanced solutions, services, and support for your large business. Complete the form below or go through one of our Sales Partners." Display and Video360, Google Marketing Platform https://marketingplatform.google.com/about/contact-us/ ; GoogleAds – "Start Now" to create a GoogleAds account and begin managing campaigns, GoogleAds, available at https://ads.google.com/intl/en_us/start/overview.

DV360 does not publicly specify spending criteria to sign up, and [redacted]. GOOG-NE-07832078 at -100, Google internal presentation, "DVAAR: DV360 Profitability," May 9, 2019

[83] Also referred to as "GAM" or Google Ad Manager

"Q. And DRX in that sentence, that's a term that you've used several times already. Can you tell us what that stands for?
A. It was meant to be an internal only name where -- that combined DFP plus AdX.
Q. Is DRX interchangeable with the name Google Ad Manager, or GAM?
A. Yes.
Q. It's the internal name for it, whereas GAM is the external name. Is that correct?"
A. Correct."

Deposition of [redacted] lead, Google (April 12, 2024) at 135:1-15.

[84] "For smaller publishers Google AdSense allows them to monetize their inventory." GOOG-AT-MDL-001004706 at-710. June 2019. "Ad Manager Ecosystem 101" - Internal Google presentation by [redacted]

[85] GOOG-AT-MDL-013268463, 2021, tab "Standard Rates" shows DFP prices at pennies per 1000 impressions

[86] "In a waterfall, the seller creates a prioritized ranking of their buyer partners. Each time an impression is available for sale, the top partner in the ranking is shown the opportunity and has the option to buy it or refuse it. If they choose to buy, they deliver their ad. If they refuse, the waterfall shows the impression to the next partner in the ranking, and the cycle repeats until a willing buyer is found." Prebid. "A Video Introduction to Header Bidding." Accessed on June 4, 2024. Available at https://docs.prebid.org/overview/intro-to-header-bidding-video.html

3) Ad Exchange – AdX

91. AdX is an ad exchange operated by Google that runs auctions that sell publisher inventory to participating advertisers. Google allows advertisers using third-party buying tools to participate in auctions held by AdX.[87] However, advertisers that use Google Ads, Google's ad buying tool for small advertisers, can only bid in auctions held by AdX and cannot participate in auctions held by third-party exchanges.[88] Publishers contract with AdX to offer their inventory for auction, typically with an approximately 20% commission paid to AdX, as a percentage of revenue generated, for inventory that is sold through the exchange.[89] Prior to 2018, publishers were able to sign separate contracts to license Google's exchange and/or ad server; subsequently, publishers only have the option of signing a unified contract under which both products are licensed.[90] Prior to the unified contract, publishers could opt to license a third-party ad server and also contract with AdX; however, under the unified contract, publishers must use Google's DFP ad server to access Google's AdX exchange.[91] At the time of re-contracting, publishers were

[87] Non-Google buying tools such as the Trade Desk and Amazon Advertisers can connect to AdX to place bids, GOOG-AT-MDL-004523197 at-197. "Display Ads Landscape" - Internal Google document, March 13, 2018.

[88] Google Ads only bids into AdX, with the exception of AwBid, a program that allows advertisers to bid into other exchanges for some retargeting impressions. GOOG-AT-MDL-004523197 at-197. Mar. 13, 2018. "Display Ads Landscape" - Internal Google document.

[89] "Q: What is the fixed revenue share that Google takes at open auction?
A: I believe it is 20 percent." Deposition of [redacted], Engineer, Google (April 14, 2024) at 118: 11-16.

[90] [redacted]
GOOG-TEX-00036237 at-239. Nov. 2017. "Unification Global Go-To-Market Plan - Global Strategy Lead" - Internal Google presentation by [redacted]
"Q. Stepping back, a partner didn't have an option to keep their AdX only contract. Is that correct?
A. Correct.
Q. They did not have an option to not go through the recontacting process?
THE WITNESS: Well, they did have an option. They could have chosen not to recontract if they didn't -- if they didn't want to." Deposition of Yoni Wilbur (April 12, 2024) at 76:9-21

[91] "Q. And are you aware of that type of contract, the DFP premium and AdX contract?
A: I am aware of a DFP contract and an AdX contract, yes.
Q: The name seems to imply that it's a combined singular contract. Am I reading that correctly?
A.: I didn't write this e-mail, so I cannot say for certain, but I would say this is referring to two separate contracts. Deposition of [redacted] (April 12, 2024) at 178:24-179:7.
"Q: And it sounds like from your testimony on behalf of Google that you're not aware of any combined DFP and AdX contracts in this 2016 period?
A: Again, I wasn't working on -- even on this team at that time, but as far as I'm aware, the combined contract was not -- was not yet available in 2016.
Q. And that's your testimony as Google's corporate representative as well. Correct?
A. Yes."
Deposition of [redacted] (April 12, 2024) at 180:10-21
[redacted] " GOOG-DOJ-27799214 at-216. Feb. 11, 2020. "AdX Direct Review" - Internal Google document

given a 45 day notice period in November of 2017 to sign the unified contract or have access to AdX terminated.[92]

VIII. GOOGLE'S DOMINANCE IN THE PUBLISHER AD SERVER, EXCHANGE, AND AD BUYING TOOLS MARKETS INTRODUCES CONFLICTING INCENTIVES

92. As the middleman between advertisers and publishers, AdX seeks to maximize the number of publishers and advertiser who join and transact on the tool. Exchanges typically compete based on the price (take rates), quality of inventory and demand. If Google were an independent exchange, it would compete on price and the number of buyers and sellers it can attract. However, because Google also owns a publisher ad server and ad buying tools, it can use these tools in service of its exchange. The DFP publisher ad server can steer inventory to the AdX exchange over rival exchanges and Google Ads buying tool makes AdX attractive by offering exclusive access to its demand.

93. Publishers seek to maximize revenue, while maintaining a commensurate level of quality. Publishers can increase revenue when they have access to many exchanges. Internal Google documents recognized the benefit publishers receive from using multiple exchanges (multi-homing across exchanges). [93]

94. Likewise, advertisers seek to maximize return on investment from purchasing advertisements. Advertisers can increase this return by accessing multiple exchanges because this broadens the set of available publisher inventory, and exchanges may compete on the fees they charge to advertisers. Google documents recognize the benefits advertisers receive from using multiple exchanges.[94]

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[92] "Q: So the e-mail does several things. It says you must sign the contract to continue using AdX or else you'll be terminated. Please find your notice of termination."
A: "The contract -- this e-mail serves multiple purposes. It is to inform them of this change, right? It is to give them information on how to sign the new contract, and it is to let them know that if they choose not to sign a new contract, that they will no longer be able to use the services after 45 days."
Deposition of Yoni Wilbur (April 12, 2024) at 224:20-225:7

[93] [redacted] GOOG-DOJ-14954902 at-915. Undated. "GDN Inventory Strategy" - Internal Google presentation

[94] "[redacted]." GOOG-DOJ-14826585 at-587. Undated. "Implications of Adwords's and AdX's bidders - Internal Google presentation.

95. If Google only owned a single tool (publisher ad server, exchange, or ad buying tool) it would represent the interests of only one group and it would have incentives to seek better terms only for the group it represents. However, since Google owns multiple tools, it has conflicting incentives which motivate much of its conduct.

96. Google acts on its conflicts of interest by taking actions that are contrary to the principles of market design I outlined above which give rise to well-functioning marketplaces. Google reduces marketplace efficiency by acting contrary to these principles of market design. publishers and advertisers to use multiple exchanges to obtain the most relevant matches and maximize gains from trade which leads to marketplace efficiency. In contrast, Google has an incentive to steer publishers and advertisers towards trading on its AdX exchange alone.[95]

97. Documentary evidence from Google is consistent with acting on the conflicts of interest inherent to its ownership of a publisher ad server, exchange, and ad buying tools.

98. In the following sections, I analyze Google's conduct and identify the relevant underlying incentives driving Google's actions. This allows me to ensure that the appropriate remedies address the incentives underlying Google's conduct as well as accord with the principles for more efficient markets.

IX. GOOGLE TIED ITS AD EXCHANGE TO ITS AD SERVER, AGAINST THE INTERESTS OF ITS CUSTOMERS

99. I understand from my discussion with Professor Gans that Google tied the DFP ad server to AdX to maintain control over publisher inventory and to have a consistent supply of inventory for its exchange and buyer tools.[96] Google's motivation to tie the DFP ad server and AdX arises from Google's incentive to use the DFP publisher ad server to steer impressions to its ad exchange

[95] "What is the primary objective of the Sellside Business? [redacted]" GOOG-NE-04001130 at-130, Google internal document "What are the guiding principles and approaches for our publisher strategy, given the ecosystem changes?" Contributors: [redacted]

[96] Discussion with Professor Gans on June 6, 2024.

and ad buying tools. Google called its strategy to use the publisher ad server to the benefit of its exchange and buying tools its "Own the Tag" strategy.

100. There are two conflicts of interest at the root of Google's tie. First, Google made Google Ads advertisers exclusive to AdX despite the fact that advertisers would have benefitted more from participation on multiple exchanges.[97] Second, Google reduced the ability for publishers using third-party ad servers to access AdX, when advertisers purchasing using AdX would have benefited from increased access to inventory.

101. In this section, I first explain Google's "Own the Tag" strategy. Second, I analyze the conflict of interest motivating Google's choice to make Google Ads exclusive to AdX. Third, I analyze the conflict of interest motivating Google's choice to limit integrations from its exchange to third-party ad servers. Finally, I analyze Google's decision to cement its tie with a unified contract.

A. Google's "Own the Tag" strategy to unify DFP and AdX

102. Google used the ad server as an inventory source for the AdX exchange. In a 2018 strategy document, Google described the "primary objective of the Sellside Business" as providing "access to quality inventory for Google demand in an efficient and profitable way."[98] Google referred to the strategy as "Own the Tag."[99] Here "tag" refers to an ad tag on a website that begins the process of identifying and filling an ad slot for an impression.[100] With "Own the Tag," Google's strategy was to ensure that tags on the webpage led to DFP before a third-party [redacted].

[97] As a reminder, AwBid is one small exception to this. But it represents a very small percentage of the Google Ads volume at ¶89 ; [redacted]." GOOG-DOJ-27759140 at-142. Nov. 2013. "AwBid – OpenX: Cross Exchange Remarketing – Deal Review – November 2013" - Internal Google presentation by [redacted]

[98] "What is the primary objective of the Sellside Business? [redacted] GOOG-NE-04001130 at-130, Google internal document "What are the guiding principles and approaches for our publisher strategy, given the ecosystem changes?" Contributors: [redacted]

[99] "[redacted]." GOOG-DOJ-28420330 at -338. Internal discussion document from 2016 discussing Google demand via Header Tags.

[100] It is my understanding that when a user visits a page, ad tags send relevant information about the user and available ad inventory to either the publisher ad server ("ad server tags") or ad exchange ("AdX Direct").

103. In an email, Google [redacted][101] Dauwalter continued to emphasize that [redacted]."[102]

104. The publisher ad server and owning the tag also protected Google's exchange from disintermediation. If Google did not have control over where impressions were routed, then other exchanges could win over AdX. To this point, [redacted]."[104]

105. Google's interest to use the ad server to provide access to ad exchange conflicts with its customers' interests. Publishers want access to multiple demand sources to increase the likelihood and relevance of a match at the best price. Likewise, advertisers also want access to multiple inventory sources to increase the likelihood and relevance of a match at the lowest cost. However, Google's interest is to limit demand and inventory sources for publishers and advertisers to its own tools. As I discuss in Section IX, once Google controlled publisher inventory through DFP, it used that control to grant advantages to AdX at the expense of its publisher customers. The tie limits publisher and advertiser participation on other exchanges where both advertisers and publishers could have made more efficient matches.

B. Google made Google Ads exclusive to AdX to benefit its exchange business, at the expense of advertisers

[101] GOOG-NE-04826786 at-786. Sept. 5, 2017. "Re: Thanks - and we're asking the wrong question" - Internal Google email between [redacted].
[102] Emphasis in email. GOOG-NE-04826786 at-786. Sept. 5, 2017. "Re: Thanks - and we're asking the wrong question" - Internal Google email between [redacted]
[103] GOOG-AT-MDL-019516306 at-307. Mar. 24, 2009. "Re: sales reductions" - Internal Google email between [redacted]
[104] GOOG-AT-MDL-019516306 at-307. Mar. 24, 2009. "Re: sales reductions" - Internal Google email between [redacted].

106. In making Google Ads exclusive to AdX, Google acted on a conflict of interest to use its advertiser customers to benefit its exchange business. Contrary to market design principles, Google restricted where Google Ads could participate, which lowered marketplace efficiency.

107. At the launch of AdX 2.0 in 2009, Google Ads (AdWords at the time) was an attractive demand source for AdX because it had "hundreds of thousands of advertisers."[105] A contributing factor to the high number of advertisers on Google Ads for Display advertising is that many small advertisers also use Google Ads for Search advertising. Advertisers used Google Ads to purchase both Search and Display. The Australian Competition & Consumer Commission (ACCC) has noted that "if an advertiser purchases a Google service through Google Ads, it may also have an incentive to purchase other services through Google Ads" as an explanation why small advertisers will use Google Ads for both.[106]

108. Since 2009, Google Ads has exclusively bid into AdX.[107] Google described the exclusivity as the way AdX was differentiated from rival exchanges.[108] However, Google created Google Ads exclusivity in conflict with its advertiser customers' interests. Advertisers want broad access to inventory to increase the likelihood of finding relevant matches. Access to multiple exchanges can increase advertiser access to inventory. Exclusivity to one exchange can reduce the likelihood of finding a relevant match.

109. Google's advertiser team agreed that [redacted] [109] The document noted that while the

[105] ADX 2.0 is the first exchange product launch after the DoubleClick acquisition. "Who are the buyers [...] AdWords: hundreds of thousands of advertisers." GOOG-NE-12146934 at -935. Oct. 6, 2009. "AdExchange Primer" - Internal Google document

[106] "Further, advertising inventory on Google's search engine can only be purchased through Google Ads, and advertising inventory on YouTube can only be purchased through Google Ads or through Display & Video 360. If an advertiser purchases a Google service through Google Ads, it may also have an incentive to purchase other services through Google Ads. There are considerable fixed costs of setting up a new online advertising campaign, including 'costs of setting up the platform, installing software and learning how to use it'.122 Therefore, once an advertiser has incurred the fixed costs of purchasing one service through Google Ads, it may choose to purchase another service through Google Ads," ACCC. "Digital Platforms Inquiry: Final Report", June 2019 at page 74, available at https://www.accc.gov.au/system/files/Digital%20platforms%20inquiry%20-%20final%20report.pdf , Accessed on June 7, 2024

[107] "Status: DoubleClick Ad Exchange 2.0 (AdX) launched on 9.17.2009" GOOG-NE-12146934 at -934. Oct. 6, 2009. "AdExchange Primer" - Internal Google document.

[108] "How will Google's AdX differentiate from other exchanges? Real-time, Access to AdWords advertisers/GCN" GOOG-NE-12146934 at -936. Oct. 6, 2009. "AdExchange Primer" - Internal Google document.

[109] "[redacted]" GOOG-NE-05243813 at-821. "GDN as an AdX Buyer: clarifying Google's auction display strategy" - Internal Google strategy document prepared by team: [redacted]

[redacted][111]

110. Google Ads advertisers would have benefited from increased inventory access. The advertiser team [redacted][113]

111. Google Ads expected that with more inventory sources it would "attract more buyers and improve spend rates."[114] With Google Ads exclusivity, Google prevented publishers and advertisers from finding the best possible trading partners, leading to marketplace inefficiency. Google's advertiser-facing tool team recognized that Google's strategy of limiting Google Ads demand to AdX did not benefit advertisers.[115] Aware of this tension between publishers and advertisers, Google's 2012 buy-side team proposed separating the advertiser facing and publisher facing products to align incentives, stating that this proposal would "do what's best for our advertisers without worrying how it might hurt our exchange business."[116] This proposal would have benefited advertisers using Google by expanding access to inventory from additional publishers.

[110] "Specifically, we have chosen to limit GDN buying only on AdX, an exclusivity that makes AdX more attractive to sellers." GOOG-NE-05243813 at-821. "GDN as an AdX Buyer: clarifying Google's auction display strategy" - Internal Google strategy document prepared by team: [redacted].

[111] "[redacted]." GOOG-DOJ-14826585 at-586. 2011."Implications of AdWords's and AdX's bidders"- Internal Google presentation.

[112] GOOG-DOJ-14826585 at-586. 2011."Implications of AdWords's and AdX's bidders"- Internal Google presentation.

[113] GOOG-NE-05243813 at-821. "GDN as an AdX Buyer: clarifying Google's auction display strategy" - Internal Google strategy document prepared by team: [redacted].

[114] "AdWords expects to attract more buyers and improve spend rates by adding additional inventory access." GOOG-DOJ-14826585 at-586. 2011."Implications of AdWords's and AdX's bidders"- Internal Google presentation.

[115] "[redacted]." GOOG-NE-05243813 at-821. "GDN as an AdX Buyer: clarifying Google's auction display strategy" - Internal Google strategy document prepared by team: [redacted],

[116] GOOG-NE-05243813 at-822. "GDN as an AdX Buyer: clarifying Google's auction display strategy" - Internal Google strategy document prepared by team: [redacted].

1) Google Ads exclusivity reduced marketplace efficiency

112. In an efficient marketplace, publishers and advertisers would trade to maximize the total surplus generated by the transaction (see Section VI.A) and web users would be shown ads that are best aligned with their interests.

113. Google Ads exclusivity to AdX denied advertiser participation on third-party exchanges, where advertisers could have found relevant matches. The lack of participation created marketplace inefficiency because advertisers could only buy from publishers that used AdX, not other exchanges, limiting the total inventory available for bidding.[117] For instance, it is inefficient for Google Ads advertisers to miss relevant inventory from non-AdX publishers. Under the exclusive arrangement between Google Ads and AdX, Google Ads advertisers had less availability to make relevant matches.[118]

114. Google could have increased marketplace efficiency by allowing Google Ads advertisers to bid on other exchanges. However, Google's motivation for exclusivity was to attract publishers to AdX and DFP. Attracting publishers to AdX and DFP meant that Google could "own the tag" and thus own the supply of inventory.

C. Google prevented third-party ad servers from receiving real-time prices from AdX

115. Before Google's contractual unification of DFP and AdX, third-party ad servers could access AdX through "AdX Direct" tags. AdX Direct allowed third-party ad servers to connect to AdX; however, third-party ad servers did not have the ability to obtain real-time prices from AdX.[119] Google described AdX Direct relationships as "[redacted] through to the publisher in real-time."[120]

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[117] For instance, Google allowed more inventory access for remarketing transaction through the AwBid program. GOOG-DOJ-27759140 at-142. Nov. 2013. "AwBid – OpenX: Cross Exchange Remarketing – Deal Review – November 2013" - Internal Google presentation by [redacted]

[118] The advertising team recognized the benefit of more inventory for advertisers, asking "[redacted] GOOG-NE-05243813 at-821. "GDN as an AdX Buyer: clarifying Google's auction display strategy" - Internal Google strategy document prepared by team: [redacted]

[119] "AdX does not integrate with other ad servers as well as it does with DFP (no dynamic allocation), so AdX does not pass through real-time bids to these other ad servers." GOOG-AT-MDL-001937115 at-115. Sept. 29, 2017. [redacted] - Internal email from [redacted].

[120] GOOG-AT-MDL-001941178 at-179. Nov. 2017. "Demand Product Primer" - Internal Google presentation.

116. An internal Google email recognized the integration between third-party ad servers and AdX was worse than with DFP and AdX, stating [redacted]).”[121]

117. Google had two solutions for improving granting third-party ad servers to access to AdX that it abandoned to maintain the DFP-AdX tie. Google developed “Third-Party Dynamic Allocation,” an internal program that would have allowed third-party ad servers to access AdX via an API.[122] Google also acquired the technology to grant third-party ad servers access to AdX as part of its acquisition of AdMeld.

118. Third-party Dynamic Allocation would have given third-party ad servers better information on real-time prices in AdX and given AdX more access to inventory. [redacted]

[121] GOOG-AT-MDL-001937115 at-115. Sept. 29, 2017. “Re: Project Yavin (Formerly Demand Product)”- Internal email from [redacted]

[122] GOOG-AT-MDL-B-004260508 at-522. Dec. 9, 2009. "Google Doubleclick: Partnership Discussion" - Internal Google presentation; GOOG-AT-MDL-B-003844625 at-625. March 2009. “Display ads business continuing to grow” – Internal slide with Key Q3 milestones described as “AdX Real-time bidder and 3rd party dynamic allocation API.”
GOOG-AT-MDL-B-004267578 at-586. October 2010. “AOL/AdX” - Internal presentation showing [redacted].

[123] “Improve is not only an SSP, but also has adserving capabilities.” GOOG-DOJ-14837888 at-889. February 10, 2012. “Re: Improve Digital going live with dynamic allocation??”-Internal email from [redacted]

[124] *See* GOOG-DOJ-15583409 at-409. February 2, 2012. “Re: Improve Digital going live with dynamic allocation??” – Internal email thread with [redacted]

[125] From [redacted]: [redacted].” GOOG-DOJ-15583409 at-409. February 2, 2012. “Re: Improve Digital going live with dynamic allocation??” – Internal email thread with [redacted]

[126] “[redacted]” GOOG-DOJ-15583409 at-409. February 2, 2012. “Re: Improve Digital going live with dynamic allocation??” – Internal email thread with [redacted]

[redacted]."[127]

119. Furthermore, before its acquisition by Google, AdMeld had developed the integrations that would make passing a real-time bid from AdX to a third-party ad server feasible. A post-acquisition integration document states, "[redacted]."[128] By 2013, Google had chosen not to support server-side APIs from AdMeld.[129]

120. Ultimately, by 2014, Google abandoned third-party Dynamic Allocation proposals and deprecated AdMeld technology, which meant that third-party ad servers would not have the same access to AdX as DFP. In an email thread, [redacted] stated that the focus had shifted away from third-party Dynamic Allocation and toward "deeper links" between DFP and AdX.[130] [redacted] echoed the sentiment on another email chain, where in response to the abandonment, they state that "our current focus is to deepen the value of DFP and AdX together."[131]

[127] From Thomas Mendrina, [redacted].

Re: Improve Digital going live with dynamic allocation??," February 2, 2012, [redacted], GOOG-DOJ-15583409 at-409. February 9, 2012. "Re: Improve Digital going live with dynamic allocation??" – Internal email from [redacted]

[128] GOOG-AT-MDL-B-005115253 at-260. Sept. 1, 2012. "AdMeld Product and Client Migration – Comms Doc" - Internal Google document authored by [redacted]

[129] "AdX will not be supporting server-side integrations." GOOG-NE-04404090 at-090. July 10, 2013. "Re: Server Side APIs" - Internal email from [redacted]

[130] [redacted] "It is very unlikely that we will now be doing 3party dynamic allocation. Our focus has shifted and we will be looking at much deeper links between dfp and adx this year." GOOG-DOJ-15169250 at-250. Apr. 8, 2014. "Re: [QUESTION] Status of 3rd-party Dynamic Allocation,"- Internal email thread with [redacted]

[131] [redacted]r wrote "We are not planning to offer 3rd party dynamic allocation. We can book DFP / AdX into a 3rd party ad server as a static allocation." GOOG-DOJ-15626678 at-678. August 18, 2014. "Re: Chinese Publisher Callouts to AdX – 3rd Party Dynamic Allocation?" Internal email thread with S[redacted].

121. In an email thread, [redacted] described abandonment of real-time prices to other ad servers and exchanges as a "strategic decision" because if publishers could access real-time prices from AdX outside DFP then "no one would sign up for AdX directly."[132]

122. Google abandoned and deprecated programs that would have allowed real-time prices for third-party ad servers. These programs could have increased participation on AdX given AdX more inventory opportunities. However, Google acted on its inherent conflicts of interest from operating the ad server and exchange so it could provide real-time prices to DFP alone, a "key differentiator for DFP."[133]

1) Preventing third-party ad servers from receiving real-time prices from AdX impaired marketplace efficiency and harmed publishers and advertisers

123. By preventing third-party ad servers from receiving real-time prices from AdX, Google restricts how publishers on third-party ad servers can participate on AdX. By selectively restricting access to real-time prices and Dynamic Allocation to DFP publishers, Google skews allocations made through AdX towards DFP publishers because they receive real-time bids while other publishers do not. Third-party exchanges are not on a "level playing field" as DFP and participation by third-party ad servers on AdX is reduced. This causes a reduction in marketplace efficiency.

124. Without real-time prices, publishers on third-party ad servers must consider where they place AdX in their waterfalls. If the publisher sets AdX first in its waterfall, then AdX will have access to all available inventory, but the publisher may miss out on another exchange willing to purchase the inventory for more. If the publisher sets AdX lower in its waterfall, then AdX is only called when other exchanges have already passed over the inventory.

125. If the third-party ad server had real-time access to AdX, then it could compare actual AdX bids with bids from other exchanges. Real-time access is especially important for publishers

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[132] "[redacted]." GOOG-DOJ-14248558 at-558. Mar. 22, 2013. "Re: AdX TOS effectively prohibits publisher from using an adserver?" - Internal Google email with Scot[redacted]

[133] *See* GOOG-NE-05243813 at-873. August 2012. "Display Strategy Working Document"- Internal Google document.

after the introduction of technology such as Header Bidding, which allows publishers to compare real-time bids across exchanges.

126. Restricting access to real-time prices also lowers marketplace efficiency for advertisers on AdX. If publisher does not rank AdX highly in its waterfall, advertisers will have less available inventory for bidding. In addition, by being lower in the waterfall, the inventory may be lower quality and less likely to be a good match for advertisers.

127. Both publishers and advertisers are harmed because they are unable to realize gains from trade fully. Suppose that Publisher A uses a third-party ad server, and ranks OpenX, which has a historical average price of $3 ahead of AdX, which has a historical average price of $2. Imagine that OpenX returns a clearing price of $2.50 and wins the impression. However, if AdX were to hold an auction, it might generate a clearing price of $6, since Google Ads Advertiser B bids on AdX auctions but not on OpenX auctions, and Advertiser B values Publisher A's impressions highly. As a result, Publisher A suffers harm corresponding to $3.50 ($6 - $2.50).

128. Continuing with the example from above, Advertiser B suffers harm because it loses an impression it values at $6 while it was sold for $2.50. Given the opportunity Advertiser B would have wished to purchase this impression at a price greater than $2.50 and would have received a payoff corresponding to the difference between $6 and the clearing price.

129. Google recognized that restricting access to real-time prices hurt marketplace efficiency for the AdX exchange by limiting inventory. In an email, product manager [redacted] stated that giving Dynamic Allocation [redacted][134]

134 "[redacted]". GOOG-DOJ-15583409 at-410. Feb. 9, 2012. "Re: Improve Digital going live with dynamic allocation??" – Internal email from [redacted]

D. Google's contractual tie of DFP and AdX ensures that its demand sources have access to steady inventory

130. Google Ads exclusivity and restricting real-time prices for third-party ad servers are two important components to Google's tie between DFP and AdX. The exclusive demand attracts publishers to AdX, and the restricted access to third-party ad servers attracts publishers to DFP.

131. By contractually requiring publishers to use DFP to access AdX,[135] Google ensured AdX had a steady inventory from DFP. Publishers must factor in access to AdX when selecting an ad server. At present, Google requires publishers to face a Hobson's choice[136]: either take Google's ad server and exchange offerings jointly or completely lose access to Google Ads if the publisher prefers using a competing or personal ad server[137].

132. The effects of these strategies are felt by rival ad servers and publishers. In a deposition, [redacted][139]

133. The unification of DFP and AdX did not give rise to potential additional efficiencies for publishers. One theoretical benefit of the ad server and exchange should have been reduced prices for publishers. Theoretically, when companies vertically integrate, costs should be

[135] GOOG-NE-04430279 at-280. January 2019. "DRX Re-Contracting Comms" - Internal document on re-contracting process, including no legacy contract renewal.

[136] A Hobson's choice is one where there is no actual choice at all.

[137] "Q. But it's correct that Google only gave partners two choices. Correct?
A. Yes, correct.
Q. And those two choices were to recontract, or sign a new contract, or be terminated. Correct?
A. That was the decision of the business, yes."
Deposition of [redacted] (April 12, 2024) at 79:15-20.

[138] "[redacted]."
Deposition of [redacted] (September 05, 2023) at 15:24 – 16:7.

[139] Publishers also discuss AdX access as a main reason to use DFP. "Q. [redacted]" Deposition of [redacted], at 35: 15-20.

reduced, and companies should pass the reduced costs to their customers. However, the take rate for AdX remained at 20% before[140] and after[141] the unification.

X. GOOGLE'S CONTROL OVER PUBLISHER INVENTORY, ARISING FROM THE TIE, ENABLED GOOGLE TO CONSISTENTLY ACT AGAINST THE INTERESTS OF ITS PUBLISHER CUSTOMERS

134. After publishers were locked into DFP due to the tie, Google used the publisher ad server to favor its exchange over other exchanges. Google's central conflict of interest is using the publisher ad server to provide inventory to its exchange and buyside at the expense of its publisher customers. With control of the publisher ad server, Google maintained access to inventory that it could make available to its exchange and ad buying tools. Publishers would have benefitted from an ad server that maximizes their revenue and is agnostic to exchanges and buying tools.

A. DFP granted Dynamic Allocation to AdX alone

135. Dynamic Allocation was motivated by Google's conflict of interest to use its ad server in service of its exchange. DFP gave AdX an advantage compared to other exchanges. In the waterfall publishers ranked non-AdX exchanges by the order in which they should be called. Exchanges with strong historical performance were generally ranked first. However, with Dynamic Allocation, AdX was at the top; it would always be called to submit a bid and could win if it could beat or tie the highest price in the waterfall and clear its own publisher set floor price.[142]

[140] GOOG-NE-01711786 at-808. Undated. "Ad Exchange Strategic Update" – Internal Google presentation.

[141] GOOG-AT-MDL-013268463, 2021, tab "Standard Rates" shows DFP prices; GOOG-AT-MDL-013268463, tab "AdX Rate Card" shows AdX pricing at 20%.

[142] "Dynamic Allocation is a way for AdManager to almost always call Ad Exchange demand but only deliver it when it maximizes revenue while making sure direct campaign goals are met." GOOG-AT-MDL-001004706 at-732. June 2019. "Ad Manager Ecosystem 101" - Internal Google presentation by [redacted]@.

"How Dynamic Allocation works

Ad Manager first goes over regular ad selection process ignoring Ad Exchange demand and selects best suited direct campaign.

[redacted]

[redacted]

[redacted]

[redacted]

." GOOG-AT-MDL-001004706 at-733. June 2019. "Ad Manager Ecosystem 101" - Internal Google presentation by [redacted]

Dynamic Allocation was exclusively available to AdX, and other exchanges were not granted Dynamic Allocation ability.

136. Google used Dynamic Allocation to ensure AdX had a steady supply of inventory and to increase AdX revenue. In a 2008 email, [redacted] described how Dynamic Allocation can increase DFP platform adoption. He stated, "I think the thing we want 'secured' is the DFP platform adoption... if we have this, we have a +20% monetization advantage due to dynamic allocation."[143] With DFP adoption, Google could control how inventory goes to the exchange and use Dynamic Allocation to win more impressions.[144]

137. Google feared the threat posed by tools that could bring features similar to Dynamic Allocation to third-party exchanges. In 2010, Google was concerned by "yield managers" that could disintermediate AdX in favor of demand sources.[145] When publishers used yield managers, the decision-making of which demand source wins an impression shifted from DFP to the yield manager.[146] If a yield manager controlled inventory routing, then AdX would compete with other demand sources and have less access to inventory.[147]

138. Google did not offer Dynamic Allocation to other exchanges. In an internal document, former Google Manager [redacted] described "restricting dynamic allocation to AdX only" as an example of how Google "tilt[s] the playing field to benefit ourselves."[148] A less-restrictive version

[143] *See* GOOG-NE-02097328 at-328. July 25, 2008. "Re: afc online vs direct."-Internal email from [redacted].

[144] "To say it differently, because we control the ad server, we can more efficiently enter our ads into the auction and will win more auctions and provide more revenue to big pubs...." GOOG-NE-02097328 at-328. July 25, 2008. "Re: afc online vs direct."-Internal email from [redacted]

[145] "Yield Managers through a scrappy service and tech offering have side-stepped our platform strategy and are 'owning the remnant tag' for a growing number of premium publishers, putting at risk our current and future control over the inventory supply." GOOG-TEX-00101777 at-780. August 2010. "Non-Premium Display Competitive Deep Dive" – Internal Google document by [redacted]

[146] "Yield Managers determines which ad network (through pub's existing relationships) gets the ad (takes 5-8% cut)." GOOG-TEX-00101777 at-789. August 2010. "Non-Premium Display Competitive Deep Dive" – Internal Google document by [redacted]

[147] "[Yield Manager] Threat to Google: "Reduced quality and volume of inventory sent to Google" GOOG-TEX-00101777 at-790. August 2010. "Non-Premium Display Competitive Deep Dive" – Internal Google document by [redacted]

[148] "[redacted]."

of Dynamic Allocation would have been if publishers could have chosen which exchange to grant Dynamic Allocation.

B. Google was threatened by the potential of Header Bidding

139. Google was threatened by "Header Bidding" - a technological innovation developed by the industry to enable ad exchanges to bid on real-time publisher impressions simultaneously. Header Bidding addressed publisher concerns around Dynamic Allocation and enabled publishers to increase yields by facilitating real-time price competition between exchanges.

140. Google set out to undermine the adoption of Header Bidding to protect its ad exchange and ad server products. Header Bidding benefited publishers by increasing yields, providing more control over the ad-selection process, and reducing operational overhead from implementing waterfall auction mechanisms. First, Google did not participate in Header Bidding. Second, Google limited the number of line items that publishers could set up in DFP thereby limiting DFP publishers' ability to implement Header Bidding efficiently. Third, Google limited publishers' ability to measure the performance of Header Bidding by redacting data fields in its Bid Transfer files that enabled publishers to match impressions to bids. Fourth, Google implemented its own server-side alternative to Header Bidding called "Exchange Bidding" which continued to provide preferential treatment to AdX by implementing a 5% take rate for third-party exchanges from which AdX was exempt. Finally, Google entered into an agreement with Meta to have Meta's "Facebook Audience Network (FAN)" not compete in Header Bidding in exchange for advantages in Exchange Bidding.

141. Google's initiatives to undermine Header Bidding reduced marketplace efficiency by skewing the allocations of impressions to favor AdX through Exchange Bidding and reducing the ability of other exchanges to compete in real-time. Absent the conflicts of interest arising from Google's suite of display advertising products, DFP would have no incentive to undermine a technology that would maximize value for its publisher customers. Instead, DFP would implement technologies such as Header Bidding to increase publisher yields, enable greater control over the ad-selection process, and reduce operational overhead for its publisher customers.

GOOG-TEX-00513684 at-684. April 10, 2015. "[redacted] – Internal Google document by [redacted]

1) Introduction to Header Bidding

142. Header Bidding was an industry response to Google only giving Dynamic Allocation to itself. Internal Google documents state that "Header bidding was developed as a reaction to EDA."[149] Industry sources such as reported that "One reason programmatic buyers like Header Bidding is that it allows them to bypass the favorable relationship Google has set up between its ad server, DoubleClick for Publishers, and its exchange, AdX [Dynamic Allocation].[150]

143. Header Bidding could improve efficiency by replacing the sequential waterfall with a simultaneous auction of auctions.[151] In a Header Bidding auction, each exchange bids for a publisher impression at the same time. The exchanges run an auction to determine the bid they will submit to the Header Bidding auction, then the Header Bidding auction will pick the highest bid offered by the participating exchanges.[152] Figure 3 below shows a general Header Bidding flow.[153]

[149] "[redacted]." GOOG-NE-06724126 at-126. Sept. 2016. "Buy Side Perspective on Header Bidding (HB) - Internal document by gTrade team: [redacted]

[150] Sarah Sluis, AdExchanger. "The Rise Of 'Header Bidding' And The End Of The Publisher Waterfall" (Jun. 18, 2015). Accessed on June 4, 2024. Available at https://www.adexchanger.com/publishers/the-rise-of-header-bidding-and-the-end-of-the-publisher-waterfall/

[151] Likewise, in the counterfactual world with a separate DFP entity there would be little incentive to grant exclusive or preferential technical access between AdX and ad servers, as is currently the case between AdX and DFP with Dynamic Allocation. As discussed in Section IX.C, Google had explored extending Dynamic Allocation to third-party ad servers going so far as to launch beta tests. However, Google abandoned such efforts as a tool to improve the attractiveness of their joint ad serving and exchange offerings through DFP and AdX. If DFP were a standalone entity, Google would have an incentive to extend Dynamic Allocation to third-party ad servers to increase revenue for AdX by facilitating the sale of additional inventory because of the advantageous real-time-pricing information it offers. Conversely, if DFP and AdX were still under the Google umbrella, but the contractual unification between the two was eliminated, Google would still have an incentive to restrict to Dynamic Allocation just DFP as a means of improving the attractiveness of their product suite.

[152] "In a waterfall, the seller creates a prioritized ranking of their buyer partners. Each time an impression is available for sale, the top partner in the ranking is shown the opportunity and has the option to buy it or refuse it. If they choose to buy, they deliver their ad. If they refuse, the waterfall shows the impression to the next partner in the ranking, and the cycle repeats until a willing buyer is found.

The waterfall's design limits publishers' ability to maximize yield, because it doesn't expose impression opportunities to all of the potential buyers and can't find the best price for each impression. Its sequential nature also makes it a slow process, which causes some impressions to go unsold." Prebid. "A Video Introduction to Header Bidding." Accessed on June 4, 2024. Available at https://docs.prebid.org/overview/intro-to-header-bidding-video.html

[153] GOOG-TEX-00105361 at-363. Apr. 28, 2017. "FAN Bidding in to DRX and AdMob" - Internal Google presentation with [redacted]

Figure 3: Header Bidding Process

144. Header Bidding was attractive to publishers because publishers could increase their yield with simultaneous bidding from multiple exchanges. Google stated that AdX does not have the same demand from advertisers as other exchanges, thus there is a benefit for publishers to introduce new exchanges.[154] In addition, Google recognized that Header Bidding allows all exchanges to compete at every price point in real time, which maximizes yield for publishers.[155] The increased revenue from Header Bidding "comes from actual bids competing with line items vs average bids."[156] Figure 4 provides a simple illustration of real-time prices versus average prices.[157]

[154] "[redacted]." GOOG-DOJ-AT-01811903 at-913. Nov. 2016. "A buy-side overview to publisher yield: Header Bidding, First Look, and Exchange Bidding" - Internal presentation.

[155] GOOG-DOJ-AT-01811903 at-921. Nov. 2016. "A buy-side overview to publisher yield: Header Bidding, First Look, and Exchange Bidding" - Internal presentation.

[156] GOOG-DOJ-06727388 at-392. Sept. 2016. "Buy Side Perspective on Header Bidding (HB)" - Internal document by gTrade team: [redacted]

[157] GOOG-TEX-00105361 at-377. Apr. 28, 2017. "FAN Bidding in to DRX and AdMob" - Internal Google presenation with [redacted]

Figure 4: Benefit of real-time prices over static prices

2) Google' was threatened by Header Bidding

145. Google saw the rise of Header Bidding as a threat to its control of the sale of publisher inventory. Publisher ad servers control the decision and routing logic of ad impressions, including managing inventory and choosing what ad to serve from a direct deal or exchange.[158] Google leveraged DFP to benefit AdX by ensuring inventory was always routed to AdX. Header Bidding allowed other exchanges an opportunity to bid in real-time, which was previously only accessible by AdX via DFP. While Header Bidding benefited publishers, Google feared that this technology might disintermediate Google's ad exchange and was willing to reduce publishers' benefit from Header Bidding to protect its position.

146. Publishers used Header Bidding as it allowed them to fully participate on exchanges outside Google. Other exchanges could offer publishers lower take rates and improved access to

[158] "Line Items represent campaigns / campaign elements within AdManager. There is a structure of objects within AdManager that lets you define your campaigns, but Line Items are the unit at which AdManager delivery operates on. GOOG-AT-MDL-001004706 at-719. June 2019. "Ad Manager Ecosystem 101" - Internal Google presentation by [redacted]@.

demand.[159] Publishers also stated they used Header Bidding to access "demand that's completely independent of Google, whom they see as competing with them as a seller. They worry that there is a conflict of interest for Google."[160]

147. Google did not participate in the Header Bidding, because Header Bidding threatened the control of inventory Google had built through Dynamic Allocation and the tie. Google's [redacted] described Header Bidding as an "existential threat" to Google's display advertising business.[161] [redacted] stressed that Google needed to "continue to be the must-call system, by ensuring as much of a publishers' demand flows through our platform, rather than Header Bidding."[162]

148. Google also responded to the threat of Header Bidding by launching Exchange Bidding. Google's [redacted] referred to the "holy grail" of Exchange Bidding goals as "the impact of EB on the reduction of HB."[163] Exchange Bidding allowed exchanges to compete in real-time; however, it charged a 5% fee to publishers, while Header Bidding charges no additional take rate.[164] The 5% fee in Exchange Bidding ensured that AdX maintained the ability to charge

[159] "Publishers typically give 4 reasons for using client-side demand callouts:
1. [redacted]

[160] GOOG-AT-MDL-013291496 at-497. Feb. 2, 2019. "Strategy Paper: Client-Side Demand" – Internal Google strategy document with [redacted]

[161] GOOG-NE-04421287 at-287. Dec. 9, 2016. "GSL Thoughts for Sell-Side Marketing Support" - Internal Google email thread with [redacted]

[162] [redacted] is quoting [redacted] in and email. "[redacted] GOOG-TEX-00094574 at-577. Mar. 14, 2017. "Sell-side 2.0 VP review - draft deck, would like to share more broadly on Monday - Internal Google email thread with [redacted].

[163] "Per our brief chat [redacted]...the buy/sell PM and sales teams are working toward setting goals. @Everyone – Important to reiterate here the risks of having ONLY a revenue target. For example...at what points does EB revenue goal become too high? At the extreme, if all DSPs stopped buying direct in AdX and moved spend to another SSP that bought through Jedi, that would be bad. In the short term in 2017, I don't think this is much of a problem – so we should agree to a reasonable revenue goal. However, this isn't like DFL with a message of grow, grow, grow... so we need other goals like the # of exchanges participating, # of pubs participating, and, the holy grail....the impact of EB on the reduction of HB." [redacted] email thread. GOOG-NE-11799063 at 067, Email, "Re: Need financial target for EB in 2017" (December 15, 2016).

[164] "Open Bidding [formerly Exchange Bidding] requests are handled by Ad Manager via a "server-to-server" integration between publishers and their demand partners. Once an ad request is generated, Ad Manager runs a unified auction to determine the best yield. This enables third-party demand partners to compete for your inventory in real-time." Google Ad Manager Help. "Learn the basics: How

20% take rate since other exchanges were handicapped by the 5% that they had to offer take rates of 15% or less to remain competitive with AdX. Exchange Bidding did not improve publisher revenue compared to Header Bidding. Google [redacted].[165]

149. Google also could use the ad server technology to impede the use of Header Bidding through line-item caps. As I understand, to run their Header Bidding arrangements, [redacted]

The limitation of active line items protects AdX against the threat of Header Bidding because it limits the how many price points Header Bidding can capture.

150. In addition, Google broke DFP publishers' ability to measure the performance of Header Bidding. Google provides two types of data files to DFP publishers: Data Transfer files, which include Header Bidding bids, and a Bid Data Transfer file, which includes AdX and Exchange bidding bids, commonly referred to as "DT" files.[170] Google broke the link that allowed publishers

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Open Bidding works -Life cycle of an Open Bidding request." Accessed on June 4, 2024. Available at https://support.google.com/admanager/answer/7128958?hl=en&ref_topic=7512060&sjid=6818735359518079257-NC

[165] "[redacted] GOOG-NE-13215119 at-123. Undated. "Overview" - Internal Google document on Exchange Bidding A/B testing.

[166] GOOG-TEX-00084843 at-844. Dec. 13, 2017. "[redacted]" - Internal Google email from [redacted].

[167] Publishers requesting increases include [redacted] See GOOG-TEX-00084843 at -844. Dec. 13, 2017. "Re: Potentially raising LI limits for Daily Mail" - Google internal email thread; [redacted]: See GOOG-AT-MDL-007290350 at-351. Nov. 4, 2021. "Active Line Items : Limits extension" - Google internal email thread. (rejected); [redacted] See GOOG-TEX-00090969 at-969. Sep. 26, 2018. "[redacted] - Google internal email thread. (partially accepted).

[168] [redacted] GOOG-TEX-00084860 at-862. Dec. 17, 2017. "Re: Potentially [redacted] - Internal Google email thread with [redacted]

[169] GOOG-TEX-00084860 at-861. Dec. 17, 2017. "Re: Potentially [redacted] - Internal Google email thread with [redacted]

[170] Australian Competition & Consumer Commission, August 2021. "Digital advertising services inquiry - final report." Accessed on June 4, 2024. Available at https://www.accc.gov.au/system/files/Digital%20advertising%20services%20inquiry%20-%20final%20report.pdf

to compare the results of these files.[171] Externally, Google described this breakage as about protecting user privacy.[172] However, [redacted][174] The redaction of the DT protected AdX against the threat of Header Bidding because it removed publishers' ability to measure Header Bidding results and effectively target users.

151. Google also entered into an agreement with Meta to combat Header Bidding. In 2017, Facebook initially announced its support for Header Bidding.[175] Around the same time, Google was trying to fight off the existential threat posed by Header Bidding and the Facebook Audience Network.[176] To stave off, the threat Google offered Meta a deal to use Google's Exchange Bidding over Header Bidding. Google and Facebook signed an agreement to allow Facebook Audience Network (FAN) to participate in Google's Exchange Bidding service in September 2018. Both Google and Meta acknowledged that the "sole reason" for the existence of Exchange bidding was to kill Header Bidding.[177]

152. As part of the Network Bidding Agreement, Meta and Google agreed to minimum spend requirements and that the parties would not publicly disclose the agreement. As part of the

[171] Prior to 2019 these files could be linked together using the "KeyPart" field, in late 2019 Google made changes to these files as part of its move to the Unified Auction which prevented these files from being connected.

[172] "We want to give publishers full transparency into the auction, while still protecting user privacy and the disclosure of proprietary data or user data that may be reflected in buyer's bids" GOOG-DOJ-AT-02204409 at-410. 2019. "Bid DT -- Breaking joinability - Market Messaging" - Internal Google document.

[173] GOOG-DOJ-31322997 at-997. June 2019. "Data Transfer - Breaking Joinability[redacted]" - Internal Google document.

[174] GOOG-DOJ-09715071 at-071. Oct. 1, 2019. "Re: Just not cricket"[redacted] Email thread about[redacted]

[175] Business Insider. March 22, 2017. "Facebook made an unprecedented move to partner with ad tech companies — including Amazon — to take on Google." Accessed on June 4, 2024. Available at https://www.businessinsider.com/facebook-announces-move-into-header-bidding-to-take-on-google-2017-3

[176] "2017 Sell-Side Priorities: AdX Value Prop update and Header Bidding and FAN response. Need to fight off the existential threat posed by Header Bidding and FAN. This is my personal #1 priority. If we do nothing else, this needs to an all hands on deck approach." GOOG-NE-04421287 at-287. Dec. 9, 2016. "Fwd: GSL Thoughts for Sell-Side Marketing Support" - Internal Google email from[redacted] discussing marketing resource allocation.

[177] Exhibit 21 from deposition of[redacted] May 2, 2024. Google EBDA Meeting notes from February 15, 2017.

agreement, Meta was granted access to proprietary Google data[178] which gave Meta an advantage over other participants in the auctions that followed. This advantage was not disclosed by Google to other participants, with Google still claiming that all participants compete equally for each impression.

3) Impact on marketplace efficiency

153. Google's efforts to "combat" Header Bidding is contrary to the marketplace principle of enabling participation, which led to marketplace inefficiency in the Ad Exchange Market. As I discussed, if all exchanges can compete at the same time, publishers can quickly find the highest-value advertiser for an impression, which enables them to maximize their payoffs.

C. Google's "Last Look" gave AdX an advantage over Header Bidding

154. Google exclusively provided AdX with the "Last Look" advantage through which AdX had the price to beat from the Header Bidding auction to transact a given impression. Google's publisher ad server DFP passed the highest bid from other demand sources including Header Bidding as a floor price or price-to-beat to the second price AdX.[179] AdX then had the ability to assess the outcome of the Header Bidding auction and decide if it "wants to make the final bid."[180] As I discuss in Section XII, Google had the ability to inflate bids from its own buying tool Google Ads, and adjust its exchange take rates through bid manipulation programs such as Project Bernanke and DRS. This meant that Google could win impressions it would have otherwise lost by inflating Google Ads bids to be at or above the floor price set by the Header Bidding auction and pay the publisher the amount of the highest Header Bidding bid.[181] Google would win these impressions

[178] Deposition of [redacted]

[179] "Last Look is a term used by some in the industry to refer to the way Dynamic Allocation works. With Dynamic Allocation, before calling AdX to run its auction, DFP determines its winning line item and passes a floor price (minimum price) into the AdX auction. This means line items from directly sold campaigns, Ad networks, other SSPs booked directly in DFP, and line items activated by Header Bidding can set the floor price of the AdX auction." *See* GOOG-DOJ-14024199 at 201, Google internal document, "Exchange Bidding 'Last Look' leak," April 5, 2017.

[180] The first price Header Bidding bid was sent as a floor to AdX. "[redacted]." *See* GOOG-TEX-00843142 at 145. Google internal document titled "First-price bidding update – 9/3/2019." September 3, 2019.

"Google maintains "last look" so it can assess the outcome of the auction and work out whether it wants to make the final bid". *See* GOOG-TEX-00103579 at 580, Google internal email from [redacted], July 12,2016.

[181] "[redacted]

even though it did not have an advertiser bid higher than the floor price when accounting for Google's take rates.

155. Google recognized that Last Look brought little benefit to publishers, and instead benefitted the exchange.[182] AdX was granted the Last Look advantage as part of Dynamic Allocation and Enhanced Dynamic Allocation as publishers began to use Header Bidding.[183] Google continued to provide AdX the Last Look advantage until it was retired as part of the move to first-price auctions in 2019.[184]

XI. GOOGLE TOOK AWAY CHOICE FROM PUBLISHERS TO BENEFIT ITS EXCHANGE AND ADVERTISER TOOLS

A. Google implemented UPR to give AdX preferential treatment to AdX and Google's ad buying tools at the expense of publisher choice

156. Google removed publishers' ability to set differential reserve prices for ad exchanges when it launched Unified Pricing Rules ("UPR") in DFP in tandem with its migration to a first-price auction format in 2019.[185] [186] Publishers use reserve prices to increase the yield for impressions, signal the quality of impressions to prospective buyers, and ensure that website visitors are served ads of acceptable quality.

[redacted] *See* GOOG-AT-MDL-013987096 at 102. Google internal document, "Publisher Monetization 101." [redacted] Undated

[182] Removing Last Look from Exchange Bidding would mean "Exchange Bidding SSPs may win more impressions, but publisher payout will be substantially the same," which demonstrates that the presence of Last Look helps the exchange more than publishers. GOOG-DOJ-14024199 at 201, Google internal document, "Exchange Bidding 'Last Look' leak," April 5, 2017.

[183] "Last Look is a term used by some in the industry to refer to the way Dynamic Allocation works. With Dynamic Allocation, before calling AdX to run its auction, DFP determines its winning line item and passes a floor price (minimum price) into the AdX auction. This means line items from directly sold campaigns, Ad networks, other SSPs booked directly in DFP, and line items activated by Header Bidding can set the floor price of the AdX auction." *See* GOOG-DOJ-14024199 at 201, Google internal document, "Exchange Bidding 'Last Look' leak," April 5, 2017.

[184] Google maintained its Last Look advantage in Exchange Bidding. "[redacted]." *See* GOOG-TEX-00103579 at 580, Google internal email from [redacted], July 12,2016.
Google noted that removing Last Look as part of the changes to the Ad Manager auction along with the migration to first-price auction and unifying floor prices. See GOOG-AT-MDL-001977826 at 844. Google internal document. "Changes to Ad Manager, AdMob auction, DVA Review." September 3, 2019.

[185] GOOG-DOJ-AT-01804815 at-820. Oct. 2018. "1st Price Migration Overview" - Internal Google presentation.

[186] More specifically, the reserves set as a part of UPR were applied to all remnant line items. This necessarily means that AdX faces the minimum reserve price across all exchanges, participating in both Header Bidding and Exchange Bidding.

157. Historically, publishers set higher reserve price floors for AdX to account for the perceived lower ad-quality of impressions served through AdX and increase diversity of demand sources.

158. UPR is also motived by Google's conflict of interest to use the DFP ad server to give preferential access to the AdX exchange. Google's motivation for UPR was to circumvent high floors for AdX by requiring publishers to set a common floor across all exchanges and ad buying tools. Google's documents indicate that publishers often implemented higher price floors for AdX to avoid low-quality advertisements that some Google Ads advertisers offered.[187]

159. UPR limited publishers' ability to use price floors to screen out lower-quality ads and limited DFP publishers' diversification of demand sources by increasing AdX's win rate. By eliminating publishers' ability to set differential price floors across exchanges, Google removed a key tool used by publishers to maximize the yield on their inventory and ensure acceptable quality advertisements were displayed on their web pages.

1) How publishers use price floors in ad servers

160. Publishers use reserve prices to increase yield and ad quality. Under a first-price auction format, the winning bidder pays their bid price to receive the good. Therefore, bidders do not have an incentive to bid their true value because such a bid would generate zero surplus if the bidder wins the auction. A bidder has an incentive to bid an amount less than their true valuation of the impression. In determining how much to shade their bids, bidders consider that a lower bid results in (i) a higher probability of losing the impression but (ii) a lower price paid if the bid is the highest and is above the reserve price. Hence, the seller's reserve price influences bidding behavior and, in turn, affects the publisher's expected revenue from that impression.[188]

161. Price floors also allow publishers to opt not to sell advertising space when it may be more valuable to use the same for themselves. For example, a newspaper can choose to advertise its own subscription service on their own ad space. A publisher could compare the revenue it would receive by selling to an advertiser to the value of using the space for some other means. Price

[187] "[redacted] GOOG-DOJ-AT-01804815 at-820. Oct. 2018. "1st Price Migration Overview" - Internal Google presentation.

[188] See Krishna, V. (2010). Auction Theory. Academic Press. Chapter 2 for a more detailed discussion. Available at https://doi.org/10.1016/B978-0-12-374507-1.00015-7.

floors allow publishers to set a threshold that advertisers must surpass to display their ads on the publishers' inventory.

162. Price floors also allow publishers to address adverse selection issues – that is, the display of low-quality ads–by encouraging participation from a diverse set of exchange and buyer channels (including those engaged in Header Bidding). For example, publishers can use price floors to ensure that certain ads are not displayed. A higher reserve price may signal to lower-quality advertisers that it should not compete for certain impressions.[189]

163. Since a key element of a seller's pricing strategy is setting their reserve price, a seller values the flexibility to set reserve prices differently across sales mechanisms because this flexibility increases their ability to maximize revenue. A seller could always set the same reserve price across sales channels, but having the ability to set different prices enhances their options. Having more instruments available for price setting may be valuable because demand and willingness to pay vary across sources.

2) Google removed publishers' ability to manage their reserve prices

164. Google also observed that publishers set different floors on each exchange they utilize. As shown in Figure 5[190] displaying an excerpt from a Google document, some publishers set high floors for AdX relative to other exchanges for a variety of reasons. [redacted] Publishers value choice across ad exchanges and some have even been willing to tolerate some revenue loss in exchange for reduced dependence on Google exchanges.[191]

165. While Google acknowledged that publishers set floors for a variety of reasons, it launched UPR to "unwind high AdX floors," to benefit the AdX exchange.[192] Google considered the higher price floors set by publishers for AdX to be a challenge for the exchange. Google also

[189] See Cai, Y., Riley, J., and Ye, L. (2007). Reserve price signaling. Journal of Economic Theory. 135(1):253-268. Available at https://doi.org/10.1016/j.jet.2006.04.005.

[190] GOOG-DOJ-AT-01804815 at-820. Oct. 2018. "1st Price Migration Overview" - Internal Google presentation.

[191] [redacted]" GOOG-NE-11809343 at-358. Jul. 2018. "DRX Unified Yield Management Strategy Review" - Internal Google presentation.

[192] GOOG-DOJ-AT-01804815 at-820. Oct. 2018. "1st Price Migration Overview" - Internal Google presentation.

acknowledged that directly addressing the perceived issue may look self-serving to publishers. In 2019, prior to the implementation of UPR, a Google employee noted that [redacted] The employee also notes that [redacted][193] Later in the year, Google rolled out UPR under the guise of moving to a first-price auction mechanism.

Figure 5: Move to the First-Price Auction and UPR

[redacted]

166. Google knew that internal programs, such as Bernanke, could cause ads that publishers found undesirable to be shown on their websites. For instance, in 2016, Google's ad exchange delivered ads to [redacted], which the publisher deemed undesirable and escalated the issue to Google.[194] A Google employee noted that the [redacted].[195] In 2017, Google noted in an internal strategy

[193] GOOG-DOJ-AT-00569648 at-648. 43586. "Fwd: First-price & Removing pricing knobs" - Internal Google email thread with [redacted]

[194] GOOG-DOJ-15084405. at-405. Dec. 14, 2016. "Fwd: NYTimes Escalation / Next Steps" - Internal Google email thread with [redacted]

[195] GOOG-DOJ-15084405. at-407. Dec. 13, 2016. "Fwd: NYTimes Escalation / Next Steps" - Internal Google email thread with [redacted]

document that [redacted] ."[196] The document also acknowledges that [redacted] [196]

167. Google launched UPR at the same time as the switch from a second-price auction to a first-price auction. Google decided to take advantage of the switch to first-price auction format to concurrently rollout the UPR while disguising the intended purpose. [redacted] stated in an email that the "AdX team wanted to use [the migration to the first-price auction] as an opportunity to significantly limit the ability of publishers to set floor-prices per buyer (which is a good goal to have)."[197] In addition, Google noted in an internal strategy document that its motivation to move to first-price auctions was to [redacted] "[198] Externally, Google told publishers that floors were less relevant with the switch to the first-price auction and that UPR was a mechanism to simplify their ad serving processes.[199] Figure 6 shows the 1st price auction changes.[200]

[196] [redacted]" GOOG-TEX-00782851 at-854. May, 2017. "Protecting Publishers from Objectionable Ads – Proposal" - Internal Google strategy document.

[197] GOOG-DOJ-AT-00569648 at-648. 43586. "Fwd: First-price & Removing pricing knobs" - Internal Google email thread with [redacted]

[198] GOOG-DOJ-AT-01804815 at-817-818. Oct. 2018. "1st Price Migration Overview" - Internal Google presentation.

[199] GOOG-NE-11725453 at-486. April 18th, 2019. "The Unified Auction, Google Top Partners Event" - Internal Google presentation.

[200] GOOG-DOJ-AT-01804815 at-823. Oct. 2018. "1st Price Migration Overview" - Internal Google presentation.

Figure 6: 1st Price Auction Changes

168. Publishers responded negatively to Google's UPR update. One publisher noted that under the UPR change, Google is "[redacted]".[203]

[201] COM-00049151 at-152. Jul. 22, 2019. "New competitive intel" - Internal Comcast email thread with [redacted]

[202] Amended Complaint for Associated Newspapers Ltd. And Mail Media, Inc. v. Google LLC and Alphabet Inc., Case 1:21-cv-03446-PKC, ¶ 195.

[203] [redacted] (August 23, 2023) at 114:22-17.

169. Some publishers sought to circumvent UPR in response to the harm it caused them using strategies such as house line items. House line items were used by publishers to promote products and services chosen by them and only served when no remnant line items (through Exchange Bidding, ad networks, price priority or bulk line items) were available to serve the impression.[204] As of November 2019, house line items were one of four methods of demand sources not subject to UPR.[205] Google [redacted]."[206] Google viewed this circumvention by publishers to be "against the spirit of UPR" and remarked that while Header Bidding usage has dampened, it continues to grow and that publishers' "desire for revenue diversification still holds."[207]

3) Impact on marketplace efficiency

170. UPR leads to less efficient allocations because publishers lose protection against low-quality ads. As I previously discussed, publishers' payoffs are affected by their users' experiences on their websites. Price floors are a tool publishers use to ensure quality advertisements on their web pages. High bids typically indicate high-quality advertisements; however, other Google programs, such as Bernanke, can subsidize low-quality advertisements, leading to transactions publishers do not want.

171. To be more precise, each ad shown on a publisher's ad space leads to a payoff for that publisher. This payoff is mainly determined by the revenue received from the advertisement, denoted by p. However, all ads are not the same, and sometimes publishers can incur a cost for showing undesirable ads. For example, a website that publishes stories for children would want to refrain from showing ads related to tobacco or alcohol products. As a result, any advertisement is potentially associated with a harm that can be measured in dollar value. Denote this harm by h.[208] Then, the quality-adjusted payoff for the publisher from showing this

[204] Google Ad Manager Help. "House line items." Accessed on June 4, 2024. Available at https://support.google.com/admanager/answer/79305?hl=en.

[205] GOOG-AT-MDL-008107072 at -74. Nov. 29, 2019. "Analysis of Demand Not Subject to UPR" - Internal Google presentation by [redacted]@.

[206] GOOG-AT-MDL-008107072 at -78. Nov. 29, 2019. "Analysis of Demand Not Subject to UPR" - Internal Google presentation by [redacted]

[207] GOOG-AT-MDL-008107072 at -86. Nov. 29, 2019. "Analysis of Demand Not Subject to UPR" - Internal Google presentation by [redacted]

[208] Note that this can be 0, or even negative, if the publisher thinks that associating themselves with a popular advertiser is beneficial for them.

advertisement is *p-h*. Notice that transacting purely based on the maximum clearing price can lead to inefficient allocations when there is harm to the publisher from low-quality advertisements. Furthermore, some demand sources might be associated with particularly harmful advertisements. For example, an ad exchange might consistently lead to bad quality advertising. As a result, the value of h might differ across exchanges. This is where reserves become a crucial tool for publishers: publishers can set higher reserve prices for these exchanges to block low quality ads (and hence, inefficient allocations).

B. Google also reduced publisher choice with EDA

172. Google reduced publisher choice when it restricted publishers' ability to opt out of Enhanced Dynamic Allocation (or "EDA") while using Google's advertising exchange AdX. Enhanced Dynamic Allocation was a program launched in 2014 which extended AdX's ability to operate at the top of the waterfall through Dynamic Allocation. Through Enhanced Dynamic Allocation, AdX would now be called to submit a bid to compete with direct deal campaigns in addition to non-guaranteed campaigns.[209] Google enrolled all new publishers by default to be set up with EDA turned on and planned to "force" the remaining publishers that initially opted out adopting EDA.[210] Google made EDA mandatory for publishers if they wanted to use AdX[211] and did not provide publishers the flexibility to turn off EDA for specific ad types or campaigns.[212]

173. EDA diminished publishers' control over demand sources for their high-value inventory. EDA allowed AdX to transact a higher proportion of publishers' high-value inventory by being able to

[209] When a publisher sells inventory in a direct deal, the publisher agrees to sell a fixed number of impressions at a fixed price. Publishers determine which impressions will be used towards meeting the total number of impressions purchased in the direct deal by setting line item priorities. Enhanced Dynamic Allocation was a mechanism that allowed AdX to win such impressions if it was able to produce a higher bid than the expected value from serving the impression as part of the direct deal.

[210] In response to the question "are all new pub[lisher]s set up with EDA turned on? And can a pub[lisher] opt out?", [redacted] responded "[t]he default is EDA on, all new networks have it on. It can be turned off in ICS [internal Google configuration system], but we don't want to mention it as an option." [redacted] also noted that "EDA is fully rolled out, with the exception of some publishers that opted out. [redacted] The remaining ones we'll force to move to EDA around the end of the year." *See* GOOG-DOJ-14141075 at-76. July 29, 2014. "Re: EDA Rollout plan." - Internal Google email thread.

[211] "It is not possible for publishers using Ad Manager to deactivate Enhanced Dynamic Allocation within the Ad Manager interface. However, it is technically possible for a publisher to use Ad Manager without the Enhanced Dynamic Allocation functionality by creating a separate "AdX Direct" account, linked to a remnant line item in Ad Manager." *See* GOOG-DOJ-05782415 at-437. Jul. 23, 2019. Google's response to [redacted] Request for Information Case No. 19/0030F.

[212] [redacted]." *See* GOOG-AT-MDL-001447559 at-559. Dec. 1, 2020. "Re: For PR Review -2021 User Groups External Recap" -

bid for impressions previously reserved for direct deals.[213] Publishers did not have the option to selectively turn off EDA for a selection of their premium inventory available through direct deals, and instead had to allow AdX the ability to bid for all of their premium inventory. Google therefore diminished publishers' ability to be selective with demand sources and publishers had to allow for the possibility of AdX serving lower-quality ad impressions for their most premium inventory.[214]

XII. GOOGLE DECREASED TRANSPARENCY FOR PUBLISHERS AND ADVERTISERS THROUGH ITS AUCTION MANIPULATION PROGRAMS

174. Google's secret auction manipulation programs reduced transparency for its customers. Google leveraged its ability to reduce transparency when launching programs such as Bernanke, Dynamic Revenue Sharing (including v1, v2, and tDRS), and Reserve Price Optimization ("RPO").

175. Project Bernanke and DRS 1 was never disclosed to customers, DRS v2 was disclosed in only a limited manner, and RPO was not disclosed for a year after launch. This lack of transparency enabled Google to implement such conducts. The lack of transparency of DRS, Project Bernanke, and RPO also hurt Google's customers, since had they known the auction rules accurately, they would adjust their behavior, which would enable them to increase their revenue (for publishers) or payoff (for advertisers) by optimizing their strategies based on these programs.

176. Google's secret programs manipulated auction rules without the knowledge of advertisers or publishers, with the common objective of increasing AdX revenue. Under Project Bernanke, GDN manipulated advertisers' bid before sending them to AdX. Under DRS v1, AdX dynamically lowered its take rate below its usual 20% in cases where the highest bid was high enough to clear the reserve price but not high enough to clear the reserve price if AdX was to take the full 20% take rate. Under RPO, AdX used data available to them to calculate a reserve price and used this reserve price in its auctions rather the reserve set by the publishers.

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[213] "[redacted]." *See* GOOG-AT-MDL-001447559 at-559. Dec. 1, 2020. "Re: For PR Review -2021 User Groups External Recap" -

[214] As noted previously, auction manipulations such as Project Bernanke played a role in Google serving lower-quality ads to publishers. "[redacted]." *See* GOOG-TEX-00782851 at-854. May, 2017. "Protecting Publishers from Objectionable Ads – Proposal" - Internal Google strategy document.

A. Google implemented Project Bernanke in Google Ads to benefit AdX

177. Prior to implementing Project Bernanke, Google Ads determined that it submitted both the highest and the second highest bid in the majority of AdX auctions that it won.[215] This meant that Google Ads could save money by decreasing the second highest bid, or not submitting it at all, because AdX held second-price auctions at this time.

178. In 2013, building on this observation, Google Ads implemented a new component to their bid submission process called "Project Bernanke."[216] Under Bernanke, a secret program, Google Ads decreased or completely dropped the second highest bid it sent to AdX in auctions where that bid was the clearing price, but still charged the same price that it would have before altering the second highest bid. Google Ads then collected this money into per-publisher pools,[217] referred to as "Bernanke pools," which was used to increase the highest Google Ads bids going into the auctions where Google Ads predicted it would lose otherwise. These pools ensured that the Google Ads take rate stayed at the contracted value for each publisher, which was around 15%.[218] This increased Google Ads win rates because it helped Google Ads win impressions that it would have otherwise lost because either (a) the top Google Ads bid was below the reserve price or (b) the top Google Ads bid was below the highest bid in AdX. As a result, allocations were skewed towards Google Ads relative to the efficient outcome.

179. In 2015, Google launched Global Bernanke,[219] which changed the pool system to an AdX-wide pool.[220] In contrast, under the original Project Bernanke pools were kept on a per-publisher basis. As a result, the money added to the Bernanke pool by decreasing the payout to publisher A can be used to increase a bid made for an impression coming from publisher B.

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[215] "[redacted]" GOOG-DOJ-28386151 at-156. Dec. 10, 2013. "Project Bernanke, Quantitative Easing on the AdExchange" - Internal Google presentation.

[216] *See* GOOG-DOJ-28386151 at-154. Dec. 10, 2013. "Project Bernanke, Quantitative Easing on the AdExchange" - Internal Google presentation. Project Bernanke was in place until Project Global Bernanke was launched in 2015 ("Global Bernanke just launched", *see* GOOG-DOJ-28385887 at-895. Aug. 17, 2015. "Beyond Bernanke" - Internal Google presentation.).

[217] *See* GOOG-DOJ-27804205 at -207. Sep. 30, 2014. "Global Bernanke" - Internal Google presentation.

[218] *See* GOOG-NE-11753797 at -838. Feb. 11, 2019. "DVAA Quality, Formats, O&O - Q1 2019 All Hands" - Internal Google presentation.

[219] "Project Bell was also known as Global Bernanke" *See* GOOG-AT-MDL-006218257 at -263. Dec. 16, 2022. Google's response to the EC's Request for Information 10 dated 31 October 2022. Case AT.40670.

[220] *See* GOOG-DOJ-27804205 at -207. Sep. 30, 2014. "Global Bernanke" - Internal Google presentation.

1) Google used Project Bernanke to benefit AdX

180. Project Bernanke benefited AdX by enabling AdX to win impressions it would otherwise lose. Project Bernanke achieved this in two steps. First, Google Ads decreased or dropped the second highest bid it sent into the AdX auction. This decreased the price paid to publishers in auctions where that second highest bid turned out to be the clearing price. However, Google Ads charged its winning advertisers as if it did not drop the second highest bid, meaning that the amount charged to advertisers was higher than the amount paid to the publishers (after taking into account the intermediary fees). Google pooled the resulting monetary value in pools. Second, Project Bernanke utilized the money in these pools to inflate the highest bid it sent into the AdX auction where either (a) the top Google Ads bid was below the reserve price or (b) the top Google Ads bid was predicted to fail to win the AdX auction. These imply that Project Bernanke enabled Google Ads to increase its win rate. Importantly, in the auctions where the highest Google Ads bid was the highest bid in the AdX auction as well, but it was below the reserve price, AdX would fail to clear the auction without Bernanke, but it was able to clear the auction with Bernanke, since it inflated the highest Google Ads bid to be above the reserve. As a result, Project Bernanke helped AdX increase its win rate. Project Global Bernanke skewed allocations towards Google in a similar manner. These increases in the win rates for AdX and Google Ads are at the expense of non-Google ad exchanges and ad buying tools.

2) Impact to marketplace efficiency

181. Project Bernanke led to inefficient allocations by enabling lower-value advertisers to win impressions instead of higher-value ones. As previously discussed, one condition for an efficient allocation is that a given impression is sold to the advertiser that values that impression the most. With Project Bernanke, Google Ads inflated its highest bids when it predicted that a rival ad buying tool would win the AdX auction. As a result, Project Bernanke and Project Global Bernanke enabled lower-value Google Ads advertisers to win impressions that would have gone to higher-value non-Google advertisers otherwise.[221]

[221] Remember that, under a second-price auction, it is in the bidders' best interest to submit their true values for the auctioned impressions as their bids.

182. To illustrate how Project Bernanke leads to marketplace inefficiency, consider an impression valued by the publisher at $3 made available to AdX with a floor price of $3.[222] AdX then calls on the ad buying tools to submit bids for the impression. Imagine that the top two Google Ads bids are $5 and $4, and there is another ad buying tool named ABC with a top bid of $6. Remember that the gains from trade is the difference between the advertiser valuation and the publisher valuation, and the most efficient allocation achieves the highest possible gains from trade. Assume first that there is no Project Bernanke. In such a case, the highest bid into the AdX auction is $6, from the ABC advertiser. As a result, this advertiser would win, and the transaction would lead to $6-$3=$3 in gains from trade. Now assume that Project Bernanke is in effect, and the Google Ads advertiser with the $5 bid has enough money in their Bernanke pool with this publisher. Then, Google Ads, predicting that there would be a higher bid from another advertiser, inflates the top bid to $7. Notice however that the advertiser valuation is still $5. With Project Bernanke, the highest bid in the AdX auction is the inflated bid from the Google Ads advertiser, and this advertiser wins. As a result, the transaction would lead to $5-$3=$2 in gains from trade, which is lower than what would have occurred without Project Bernanke. In this example, Google Ads buyer offer lower quality ads. Hence, Project Bernanke leads to inefficient allocations.

3) In Project Bernanke, a lack of transparency enabled Google Ads to manipulate advertisers' bids

183. For Project Bernanke, Google Ads decreased or completely dropped the second bid it submitted to AdX in auctions where it predicted that it would submit the highest and the second highest bid, decreasing the clearing price. Google Ads then pooled this money in a pool and used it to inflate the highest bids it sends to AdX in auctions where it predicted that it would lose. However, Google chose not to disclose Project Bernanke to customers. This is because Google wanted to reap the full benefits of Project Bernanke. If Google Ads announced the conduct to the public (a) the advertisers would shade their bids, and (b) publishers would increase their reserve prices to take advantage of the inflated top bids. This would mean that some of the benefits of the conduct would go to Google's customers. However, since Google did not disclose the

[222] It is expected that the sellers incorporate their valuations into the calculation of the reserve price, however they do not need to be the same. For example, any clearing price above the reserve would generate a positive revenue for the publisher if they set the reserve to their value for the item. Or, the reserve price can be equal to the highest value they can generate if the item is not sold through the auction, their so-called "opportunity cost" or "outside option." In general, the seller does not always set their reserve prices equal to their true valuation for the auctioned item. However, for the sake of simplicity, in this example I assume they are equal.

conduct, publishers and advertisers never got to adjust their behavior accordingly. Hence Google Ads used the conduct to increase its win rate.[223] As a result, Google's concealment of Project Bernanke deprived its customers form potential benefits.

B. Google implemented Dynamic Revenue Sharing Programs to benefit AdX

184. Prior to implementation of Dynamic Revenue Sharing, Google's take rate was always equal to 20% of what was charged to the advertiser per auction. Under the second-price auction that Google was using during the duration of DRS and its variants, this would mean that Google took 20% of the second highest bid and the remaining 80% of the second highest bid would be passed to the publisher.

185. DRS v1 was launched in August 2015, but no announcements were made to the publishers or the advertisers at the time of the launch. Under DRS v1, AdX dynamically lowered its take rate below its usual 20%, depending on a variety of factors like the highest and the second highest bid, publisher reserve prices, and take rates among the auctions for the publisher's impressions in that billing period.[224] When the highest bid is high enough to clear the reserve price but not high enough to clear the reserve price if AdX were to take the full take rate, AdX dynamically decreased the take rate so that it wins the impression.

186. DRS v2 was launched in 2016, and Google announced the launch. Although publishers were allowed to opt out of DRS v2, if they did, they would automatically opt out of DRS v1 as well.[225] Under DRS v2, AdX dynamically decreased or increased its take rate to win impressions that it would not win with its usual 20% take rate. The main difference from DRS v1 is that take rates are now adjusted up or down from the usual 20%, depending on a certain number of factors including the first and second highest bid, the publisher reserve, and the debt balances for publishers and advertisers.[226]

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[223] Project Bernanke does not benefit Google Ads' advertisers, since any time they win additional impressions due to Project Bernanke, they pay their own bid. Since Google ran a second-price auction at the time, this means that the advertiser's payoff from winning that impression is 0.

[224] GOOG-TEX-00777528 at-530. Sep. 2, 2015. "Re: [Monetization-pm] Re: [drx-pm] LAUNCHED! AdX Dynamic Revenue Share (DRS)" - Internal Google email thread with [redacted]

[225] "Pubs have until August 1st, 2016 to opt out of DRS (which requires them to check the box in the UI) which will also opt them out of DRS v1." GOOG-NE-04934281 at-283. May. 13, 2016. "Dynamic Revenue Share" - Internal Google document by [redacted], [redacted]

[226] GOOG-NE-13222752 at-752. Aug. 31, 2018. "Make Combined Auction Side Effect Free and Rewindable" - Internal Google document.

187. The third and last iteration of Dynamic Revenue Sharing was tDRS, launched in 2018.[227] Under tDRS, AdX dynamically increased or decreased its take rate from its usual 20% to win impressions that it would otherwise not win. Under DRS v1 and DRS v2, Google adjusted its take rate after observing the submitted bids. The main difference for tDRS was that the dynamic take rate was determined based on historical AdX data before observing the submitted bids.[228]

1) In DRS v1, DRS v2, and tDRS, a lack of transparency enabled AdX to adjust take rates

188. For DRSv1, AdX dynamically decreased its take rate to clear more impressions, while making sure that its average take rate did not go below 19%. However, Google never disclosed this conduct to advertisers or publishers who sell or buy impressions through AdX.[229] This is partially because, in the auctions where AdX decreases its take rate, the advertisers are charged their bid, akin to a first-price auction. If the advertisers knew this was a possibility, they would shade their bids in such a situation. This would suppress the bids, reducing AdX revenue, since AdX takes a percentage of the clearing price as its fee. As a result, Google chose to not reveal DRSv1 to its customers, enabling AdX to increase its win rate[230] without facing the repercussions of shaded bids.

C. Google implemented Reserve Price Optimization programs to benefit AdX

189. Under Reserve Price Optimization, AdX used data available to them prior to observing the bids calculate a reserve price and use this reserve in its auction rather than the reserve set by the publisher. This reserve price was at least as large as the reserve set by the publisher and was meant to maximize AdX's revenue. RPO was launched in phases between April and October 2015

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[227] "[redacted] GOOG-TEX-00858434 at -834. May 13, 2016. "Dynamic Revenue Share" - Internal Google document by [redacted]

[228] GOOG-AT-MDL-019244499 at-499. "Truthful DRS Auction Walkthrough" - Internal Google document.

[229] DRS was launched without announcing it to publishers or advertisers. "[redacted]" GOOG-NE-10544618 at-748. Apr. 2014. "Meeting Notes: DRX Suite Commercialization" - Google internal meeting notes from October 2014-June 2016.

[230] "DRS dynamically changes the AdX sell-side revenue share so that more actions result in transactions." GOOG-TEX-00777528 at-530. Sep. 2, 2015. "Re: [Monetization-pm] Re: [drx-pm] LAUNCHED! AdX Dynamic Revenue Share (DRS)" - Internal Google email thread with [redacted].

without an announcement of the launch to the customers.[231] Google only announced RPO to its customer a year and a half after the launch.[232]

190. When RPO increases reserve prices, it can lead to an increase in publisher revenue. However, since the program was not announced to publishers, publishers would not be able to maximize their revenues under the scheme. Since advertisers face higher reserve prices under RPO, the program would decrease the number of impressions won by advertisers while increasing the average price paid by advertisers, lowering their surplus.

1) In RPO, a lack of transparency enabled AdX to manipulate reserve prices

191. For RPO, AdX dynamically increased the reserve prices in auctions to increase the clearing price. An increased clearing price leads to higher AdX revenue since it takes a percentage of the clearing price as its fee, as long as the auction is still successful. However, Google chose not to announce the conduct to the public for a substantial period of time.[233] Had the publishers and advertisers known, they would have acted differently in order to maximize their profit or payoff. First, the publishers would change their reserve prices. Reserve prices are an important tool of revenue maximization for publishers. If they knew Google was going to adjust their reserve prices, they would take that information into consideration when they are calculating their optimal reserve prices. As a result, by concealing RPO, Google interfered with the publishers' revenue maximization, potentially decreasing their revenue compared to what it would have been if they had full information about the auction process. In addition, RPO could interfere with publishers choosing to set low floors, for instance, if a publisher was running tests to find optimal pricing. Second, the advertisers would adjust their bidding behavior as well. Since RPO increased reserve prices dynamically based on past data, the advertisers' bidding patterns now can influence the reserve prices they face in the future. As a result, even though AdX ran a second-price auction at the time, had they known, the advertisers might have wanted to shade

[231] GOOG-NE-06151351 at-351. Nov. 11, 2015. "Monetization-pm" Re: [drx-pm] LAUNCHED! Dynamic Pricing (RPO) for AdX sellers - Internal Google launch email; "NO EXTERNAL COMMS " GOOG-NE-10544618 at-748. Apr. 2014. "Meeting Notes: DRX Suite Commercialization" - Google internal meeting notes from October 2014-June 2016.

[232] Jonathan Bellack. "Smarter optimizations to support a healthier programmatic market" (May 12, 2016). Accessed on June 7, 2024 via the Wayback Machine. https://web.archive.org/web/20200929015943/https:/blog.google/products/admanager/smarter-optimizations-to-suppor/

[233] "We have been working on RPO for a while" GOOG-NE-09485306 at -432. Nov. 2015. "[OLD] - Meeting Notes - DRX Indirect Commercialization" - Internal Google document

their bids, to increase their future payoff by decreasing future reserve prices. As a result, both the publishers and the advertisers could act accordingly if they knew RPO was in effect. This potentially reduces their revenue or payoff compared to what they could have been.

XIII. GOOGLE'S HARM TO COMPETITION, PUBLISHERS, AND ADVERTISERS REQUIRES A REMEDY BEYOND INJUNCTIVE RELIEF

192. In Sections IX-XII, I discuss how Google's anticompetitive conduct has reduced marketplace efficiency to the detriment of publishers and advertisers. Google's conduct has constrained participation, lowered transparency in auctions, and created unclear or perverse incentives instead of straightforward incentives for participants. Google's conduct results from the inherent conflicts of interest in operating across the ad tech stack, with dominant ad server, ad exchange, and ad buying tools.

A. Google's pattern of anticompetitive conduct suggests that it will continue to act against the interests of its customers

193. Google's historical pattern of anticompetitive and deceptive conduct involves using its ad server to benefit its exchange and ad buying tools at the expense of its publisher customers. This behavior illustrates the underlying conflicts of interest for Google. I briefly recap that pattern here.

194. I discuss in Section IX how Google's "Own the Tag" strategy ensured that DFP controlled inventory access and routing to AdX. Google used its Google Ads advertisers to attract publishers to AdX and gave third-party ad servers worse access to AdX compared to DFP, making third-party ad servers less attractive to publishers. The goal of the tie was to lock publishers onto DFP, from where Google could steer impressions to its AdX exchange over other exchanges.

195. After publishers were locked onto DFP, Google could control impression routing and information sharing to benefit its exchange against publisher interests, as I discuss in Section IX-X. With control over the ad server, Google granted itself special privileges, such as using Dynamic Allocation to put itself at the top of the waterfall. When presented with threats to its exchange such as Header Bidding, Google responded by refusing to participate in Header Bidding, even after recognizing that Header Bidding increased publisher revenues. Instead of competing within

Header Bidding, Google instead had DFP give AdX inside information about the winning bid from Header Bidding.

196. Further, Google removed publishers' ability to make choices about how to manage their inventory to benefit its exchange, as I discuss in Section XI. Google launched UPR in response to high floors on AdX. Rather than improving AdX quality or respecting publishers' decisions on setting floors for other exchanges, Google removed publishers' ability to decide altogether. Likewise, Google overrode publisher decision-making on Enhanced Dynamic Allocation by enrolling publishers automatically and hiding where publishers could opt-out.

197. Finally, Google decreased transparency by deceptively changing auction rules and bidding rules, as I discuss in Section XII. Google did not disclose their secret programs. Had publishers and advertisers known about these programs, they would have the opportunity to adjust their behavior. With DRS v1, v2, and tDRS, Google changed auction rules to ensure that AdX won more over other exchanges. With RPO, Google concealed information that publishers would have considered when developing their reserve price strategies. With Bernanke, Google secretly adjusted bids in Google Ads to benefit AdX.

198. Google's historical and present conduct follows a pattern of using its ad server to grant special privileges to its exchange and ad buying tools at the expense of its publisher customers. Google has also acted against the interest of its advertiser customers. Based on this pattern, Google is likely to continue to pursue a strategy that leverages its power over buyers and sellers to its own benefit and against the interests of its customers.

199. For instance, although Google removed its Last Look advantage over Header Bidding from the unified auction, Google introduced a program with a similar effect by sharing "Minimum Bid to Win" data with AdX and Exchange Bidding buyers and not Header Bidding buyers.[234] Minimum Bid to Win data effectively recreates Last Look, because AdX and Exchange Bidding buyers can use the information from Minimum Bid to Win on their next auctions, while Header Bidding buyers cannot.

[234] "Ad Manager provides the "minimum bid to win" for each impression, but that figure is disclosed only ex-post, and it is provided equally to all buyers in the unified first-price auction." GOOG-TEX-01008317 at-321. 2019. "Digital Advertising Market Study Follow-up to Google/CMA meeting on 28 October 2019"

200. In addition, regulatory agencies and industry experts have raised concerns about Google's proposed Privacy Sandbox, which include deprecation of 3rd party cookies on its Chrome Browser.[235] Google's proposed replacement for third-party cookies is a set of tools in Google's "Privacy Sandbox" where the browser will infer categories based on recent browsing history that DSPs will use instead for targeting. Should the Privacy Sandbox be launched, Google would be in a position where it controls an important service – data needed for targeting – offered to its ad buying tool rivals. Google would then be in a position to reduce data access and information available to rivals. In addition, as part of Google's Privacy Sandbox proposals Google has indicated it intends to move key ad-decision making tasks in its Chrome browser through its AdTech tools, creating further opportunities for conflicts of interest.[236][237]

B. The market is unlikely to self-correct and resolve Google's market power

201. Professor Gans has found that Google's conduct has led to anticompetitive effects and established Google's monopoly power in the Publisher Ad Server Market and in the Ad Exchange Market.[238] Google's conduct has raised barriers to entry in both Markets. An exchange entrant must compete not only with AdX and rival exchanges, but also with AdX's preferential access to DFP inventory. A publisher ad server entrant must compete not only with DFP, but also with DFP's preferential access to AdX demand. Faced with the barriers to entry arising from Google's conduct, rivals and potential rivals have failed to discipline Google's market power. This indicates that competition cannot by itself remedy the barriers to entry created by Google's conduct.

202. Google's pattern of behavior and ongoing incentives, described above, demonstrates that it is reasonable to expect that Google will seek other ways to link its ad server and exchange, keeping artificial barriers to entry in place. Only enjoining Google's current anticompetitive or deceptive conduct will not address the inherent conflicts of interest that create an incentive for Google to engage in such practices. Therefore, given Google's dominant positions, it is

[235] Discussion with Dr. Chandler on June 6, 2024

[236] "With Chrome acting as an active participant in a financial transaction (the ad auction) and delivery of goods (serving the ad)" "IAB Tech Lab Releases In-Depth Analysis Of Google's Privacy Sandbox For Public Comment, Revealing Significant Challenges" *IAB* Tech Lab, Feb. 6, 2024, https://iabtechlab.com/press-releases/iab-tech-lab-releases-in-depth-analysis-of-googles-privacy-sandbox-for-public-comment-revealing-significant-challenges/ Accessed June 7, 2024.

[237] I understand that Google's Privacy Sandbox and deprecation of 3rd party cookies are still under evaluation and not yet implemented. Accordingly, I reserve the right to supplement my report with respect to any supplemental discovery concerning this topic that may occur before trial.

[238] Discussion with Professor Gans on June 6, 2024

unreasonable to expect that only enjoining this conduct would cause a sustained increase competition in the Ad Server, Ad Exchange, and Ad Buying Tool Markets.

XIV. AN APPROPRIATE REMEDY WILL SERVE THE PRINCIPLES OF MARKET DESIGN AND LOWER BARRIERS TO ENTRY, LEADING TO INCREASED COMPETITION

203. The goal of a remedy is to resolve the effects of Google's anticompetitive and deceptive conduct and to increase competition in the Publisher Ad Server Market and the Ad Exchange Market by reducing barriers to entry. An effective remedy will therefore address Google's incentives and ability to undertake anticompetitive and deceptive conduct, which have driven a pattern of behavior that increased Google's market power and increased barriers to entry in these Markets.

204. Marketplace efficiency increases when markets are more transparent, encourage participation, and have straightforward incentives. In display advertising, marketplace efficiency leads to greater gains from trade for publishers and advertisers. Marketplace efficiency increases when publishers find advertisers with the highest willingness to pay for a given impression. Likewise, marketplace efficiency increases when advertisers find inventory that increases return on investment.

205. With the goals of increasing competition and marketplace efficiency in mind, I use principles from market design as the basis for my views on appropriate remedies. In this section, I assess how specific remedies can lower barriers to entry and increase participation, increase transparency, and yield straightforward incentives, leading to increased efficiency.

206. Antitrust remedies are categorized as "structural" – divestiture of a business or set of assets - and "behavioral" – a set of rules that must be followed.[239]

[239] "Merger remedies take two basic forms: one addresses the structure of the market, the other the conduct of the merged firm. Structural remedies generally will involve the sale of physical assets by the merging firms. In some instances, market structure can also be changed by requiring, for example, that the merged firm create new competitors through the sale or licensing of intellectual property ("IP") rights. A [behavioral] remedy usually entails injunctive provisions that would, in effect, manage or regulate the merged firm's postmerger business conduct." U.S. Department of Justice. (October 2004). "Antitrust Division Policy Guide to Merger Remedies" -at page 7. Note: All Merger Remedies Manual have been withdrawn or superseded (2020, 2011, and 2004).

207. I first consider how structural remedies resolve the underlying incentive issues and reduce barriers to entry. As I discuss in Section VIII, Google's pattern of conduct is rooted in the ability and incentive to use its monopoly positions to limit competition. Structural remedies resolve Google's conflicts of interest - by removing its dual position serving both buyers and sellers – and, therefore, remove Google's incentive and ability to engage in similar anticompetitive conduct in the future.

208. I also consider the extent to which behavioral remedies can increase competition. I discuss how behavioral remedies can increase participation and market thickness for advertisers and publishers, increase transparency, and support more straightforward incentives. Behavioral remedies do not resolve, only provide ways to manage, the underlying conflicts of interest that create Google's incentive to engage in anticompetitive conduct. Behavioral remedies are also vulnerable to the ways in which Google may work around the restrictions to its own benefit. Indeed, behavioral remedies require monitoring, which can be costly and not fully effective.[240]

A. Structural remedy

209. Google has persistently engaged in conduct that raises the cost of multi-homing to its exchange and publisher ad server customers. A separation of the ownership of Google's ad server and exchange would resolve the incentive to use control of one to influence the other and to raise costs of multi-homing. The most complete separation is a divestiture.

210. Divestiture of the publisher ad server would be an appropriate remedy to increase competition. With divestiture, Google would no longer be in a position to benefit its exchange product at the expense of its ad server customers.

211. Based on Google's past conduct and ongoing incentives to engage in similar conduct in the future, divestiture of the ad server will reduce barriers to entry and increase competition in the Publisher Ad Server and Ad Exchange Markets. A divestiture stands to fully resolve issues

[240] The Department of Justice noted in its policy guide to merger remedies that non-structural remedies suffer from substantial costs including continuous monitoring. "Conduct remedies suffer from at least four potentially substantial costs that a structural remedy can in principle avoid. First, there are the direct costs associated with monitoring the merged firm's activities and ensuring adherence to the decree. Second, there are the indirect costs associated with efforts by the merged firm to evade the remedy's "spirit" while not violating its letter. [...] Third, a conduct remedy may restrain potentially procompetitive behavior. [...] Fourth, even where "effective," efforts to regulate a firm's future conduct may prevent it from responding efficiently to changing market conditions. U.S. Department of Justice. (October 2004). "Antitrust Division Policy Guide to Merger Remedies" - at page 6. Note: All Merger Remedies Manual have been withdrawn or superseded (2020, 2011, and 2004).

emanating from the conflicts of interest, as Google would no longer be able to use the ad server to steer impressions to its exchange or use its exchange to drive adoption of its ad server. In this section, I explain that removing the links between the ad server and exchange, created by Google's conduct, will reduce barriers to entry in both corresponding Markets.

212. An independent DFP will operate in the interests of its publisher customers, enabling publishers to trade with their preferred exchange partners on their preferred terms. Divestiture will remove the tie between DFP and AdX and remove the preferential access that DFP provided to AdX. Divestiture will lower barriers to entry into the Publisher Ad Server Market, since ad servers can then compete on the basis of quality and price and publishers do not face the risk of losing access to AdX demand based on their choice of ad server. Divestiture will lower barriers to entry in the Ad Exchange Market, since an independent DFP will enable publishers to grant access to exchanges on their preferred terms rather than terms set by Google; importantly, exchanges can compete on price and quality to receive access to publisher inventory, especially for any preferential access such as that granted to AdX in Dynamic Allocation. Thus, publisher ad servers can compete without having to tempt publishers away from AdX demand and exchanges can compete without being subject to last look and other disadvantages imposed by Google.

213. Divestiture removes the incentive and ability for Google to tie its exchange to Google's publisher ad server in the future. If DFP were divested, then AdX would be incentivized to grant full access to third-party ad servers since this would increase participation on the exchange. AdX would have no incentive to restrict inventory it can attract to the exchange. In the Ad Exchange Market, furthermore, when conflict of interest issues are resolved, competitive forces would lead Google to act in a manner aligned with its customers' interests.

214. In addition, as a divested tool, DFP would have no incentive to steer impressions to a specific exchange. Instead, the interests of the divested DFP would align with the interests of its publishers, and DFP would try to maximize publisher revenue by multi-homing across exchanges. If the divested DFP did not align with the interests of its publisher customers, then publishers would be in a better position to switch ad servers. With the dissolution of the tie, publishers could leave DFP for a third-party ad server and no longer need to weigh the benefits

of an alternative ad server against the cost of losing access to AdX. Likewise, the divested DFP would have an incentive to compete with other ad servers on the tools and services it can offer.

215. The divestiture would not address Google's deceptive conduct that lowers transparency about auction rules and bidding practices nor would it address potential conflicts of interest between operating the exchange and serving Google's ad buying tools customers. As a result, an appropriate remedy package may include both structural and behavioral remedies to full address Google's conduct.

B. Behavioral remedies

216. In this section, I analyze behavioral remedies that can restore competition. I evaluate the effectiveness of the remedy by applying the market design principles and testing whether the remedy will aid in lowering barriers to entry and increase efficiency. In this section, I identify remedies that are consistent with market design principles for well-functioning markets such as non-discriminatory interoperability, internal separation with best interest duties and firewalls, and transparency disclosure requirements.[241]

217. Allowing publishers to set Google's publisher ad server to work with other ad exchanges and Google's ad exchange to work with other publisher ad servers would lower entry barriers because it allows new entrants work with existing tools and compete with Google's products on the merits. Publishers and advertisers will be able to choose the tool that best fits their needs with unrestricted access to other third-party ad servers and exchanges. However, there is a risk that Google will degrade connections that publishers desire between Google's tools and third-party tools. The weakness of behavioral remedies is that they do not address the underlying conflicts of interests at the root of Google's conduct.

218. Behavioral remedies such as non-discriminatory interoperability improve **participation** and market thickness by allowing publishers and advertisers to use third-party tools more easily. Interoperability allows Google's publisher ad server to work with other ad exchanges and Google's ad exchange to work with other buy side tools. Google's conduct has created artificial

[241] The applicability of these behavioral remedies from market design principles is recognized in DOJ Merger Remedy Manual. "The most common forms of stand-alone conduct relief are firewall, fair dealing, and transparency provisions." U.S. Department of Justice. "Antitrust Division Policy Guide to Merger Remedies" (October 1, 2004) at page 22. Note: Past antitrust authorities recognized these as potential behavioral remedies, but all Merger Remedies Manuals have been withdrawn or superseded (2020, 2011, and 2004).

barriers for publishers and advertisers to participate in third-party ad servers and exchanges. Interoperability also lowers entry barriers because it lets new participants work with existing tools and compete with Google's products on the merits. Publishers and advertisers will be able to choose the tool that best fits their needs with unrestricted access to other third-party ad servers and exchanges.

219. Internal separation with best interest duties and firewalls help yield **straightforward incentives**, whereby each tool in or interacting with the marketplace will have the appropriate incentives to maximize the objectives of the side of the marketplace they represent. For example, an ad buying tool would solely aim to further the interests of advertisers and a publisher ad server would solely represent the interests of publishers. Internal separation would require Google's ad server, exchange, and ad buying tools to be separate entities inside Alphabet. As part of internal separation, each tool would have best interest duties to its customers and firewalls would need to be in place to prevent data sharing between tools, including the results of experiments. Internal separation and firewalls aim to align the incentives of tools with their customers' goals. However, internal separation requires strict monitoring to ensure commitments are upheld.

220. Behavioral remedies around auction disclosures increase **transparency** in the marketplaces. Google's conduct has lowered transparency by changing auction rules without the knowledge or consent of publishers or advertisers. When publishers or advertisers are not clear about auction rules, they do not know how best to respond and the best way to transact. For instance, advertisers need clarity on what auction is being run (*e.g.*, first-price vs second-price), as the auction format informs how advertisers place bids. Disclosures such as granular bid transaction data and routing rules allow publishers and advertisers to audit Google's conduct. If publishers and advertisers know Google's conduct and can audit outcomes, they can decide whether to change their strategies or use another tool. However, it is difficult to design transparency requirements that identify and protect against future concerns and conduct that reduces transparency.

C. Non-discriminatory interoperability lowers barriers in the Ad Server and Exchange Markets

221. A rule requiring non-discriminatory interoperability would facilitate access to Google's exchange and increase competition in the Publisher Ad Server Market. Such a rule would mean

that Google cannot impose restrictions on publishers' ability to offer their inventory to exchanges and other demand sources, *e.g.*, would allow publishers using third-party ad servers to offer their inventory for sale through AdX. Non-discriminatory interoperability would allow publishers' choice over the terms of sale and their advertising trading partners. Interoperability helps make markets become thick because interoperability increases access points for publishers and advertisers to participate. Interoperability between third-party ad servers and AdX increases the number of publishers who can use AdX from an ad server of their choice. Interoperability between Google Ads and third-party exchanges increases available inventory for Google Ads and increases demand on other exchanges.

222. Beyond increasing access, interoperability should also be "non-discriminatory," so that third parties have the same access to publishers and advertisers as Google.[242] For instance, when Google allowed third-party ad servers to access AdX, only DFP and not third-party ad servers could receive real-time bids from AdX. In addition, while Exchange Bidding allowed third-party exchanges to compete for DFP impressions, it charged a 5% fee to third-party exchanges that AdX did not incur.

223. Furthermore, with non-discriminatory interoperability Google tools should not give information advantages to other Google tools. For instance, with Last Look, the DFP ad server gives AdX an information advantage over Header Bidding, by allowing the clearing price of the second-price auction (AdX) to be only a penny more than the result a first-price auction (Header Bidding).[243] Google has continued to offer information advantages as part of Minimum Bid to Win. Unequal treatment such as this tilted the balance in favor of Google's products.

224. Non-discriminatory interoperability can address Google's tying conduct, which restricted third-party ad servers' access to AdX. In this section, I consider three applications where non-

[242] Scholars also use the term "equitable interoperability." "'Equitable interoperability' means that an entrant can not only join the platform, but join on qualitatively equal terms as others, without being discriminated against by the dominant platform that might have its own competing service. Equitable interoperability facilitates competition in innovation and differentiation by digital services but entails oversight by a regulator that determines when advances should become part of the regulated interface. It effectively prohibits self-preferencing and discrimination against firms that are not part of the dominant ecosystem." *See* Morton, F.M.S. et al. (2023). Equitable Interoperability: The "Supertool" of Digital Platform Governance. Yale Journal on Regulation. 40(3): 1013-1055 at-1016.

[243] "Instead of predicting competing bids and bid shading accordingly, the advertiser is allowed to bid shade perfectly, $0.01 higher than the next highest source. AdX guarantees the buyer pays the minimum needed to win the auction. [...] Last look can even lead to inefficient market outcomes (see example D) [when the buyer with the highest willingness to pay is not allocated the impression]." GOOG-DOJ-AT-02138562 at-570. Undated. "Last Look Advantage" - Internal Google presentation explaining Last Look Advantage over Header Bidding.

discriminatory interoperability rules can increase participation and market thickness, thereby improving competition in digital advertising marketplaces. First, I consider interoperability between third-party ad servers and AdX. Second, I consider interoperability between Google Ads and third-party exchanges. Third, I consider interoperability between DFP and third-party exchanges.

225. Finally, for non-discriminatory interoperability to be effective, publishers and advertisers need to be able to make choices about what tools they use. For instance, as I've discussed above in Section XI, reserve prices are a tool publishers have to control for quality. Undoing UPR restores DFP publishers' ability to decide on the appropriate reserve prices for exchanges and ad buying tools.

1) Non-discriminatory interoperability between third-party ad servers and AdX

226. Google's tie restricts competition in the Publisher Ad Server Market by restricting third-party ad servers' access to AdX because publishers must forgo access to AdX if they wish to use a third-party ad server. A non-discriminatory interoperability rule would mean that Google cannot restrict third-party ad servers ability to offer their inventory for sale through AdX.

227. Non-discriminatory interoperability between third-party ad servers and AdX increases participation by publishers who use third-party ad servers on AdX. As a result of increased participation, marketplace efficiency for publishers and advertisers on AdX increases, because there is more inventory available to make matches.

228. Another benefit of non-discriminatory interoperability for third-party ad servers is that it allows publishers to choose what best meets their needs without losing access to AdX demand. Publishers could opt not to use DFP without fear of losing access to demand. The potential to switch puts pressure on third-party ad servers to compete to attract publishers. Publisher ad servers could entice publishers to switch to improved ad server offerings, which brings forth the beneficial effects of competition.

229. A rule requiring non-discriminatory interoperability would require AdX to allow access from third-party ad servers and allow third-party ad servers to receive real-time bids from AdX. Prior

to Google's November 2017 reformulation of DFP and AdX into a unified contract, third-party ad servers were allowed access to AdX. However, as I discuss in Section IX.C, third-party ad servers could not access real-time bids from AdX and only used static bids. As a result, the interoperability that Google offers to third-party ad servers was still discriminatory.

230. Real-time access to ad exchanges lowers barriers in the Publisher Ad Server Market and restricted real-time access lowers participation of non-DFP publishers on AdX. Publishers have acknowledged that if they could have the same access to AdX via a third-party ad server, then they would consider switching ad servers.[244] As a result, real-time access to exchanges lowers barriers in the Publisher Ad Server Market and increases the ability for third-party ad servers to compete. Google had the technology to give real-time access to third-party ad servers and recognized the need for real-time access for third-party ad servers. As I discuss in Section IX.C, Google deprecated the technology for real-time prices to third-party ad servers to strengthen the unification of AdX and DFP.

231. Google has also [redacted]

[244] I understand that switching costs still act as barriers for publisher ad servers.

"Q: But can you tell the jury what The New York Times told the Texas Attorney General about alternatives to DFP? A: New York Times believed that AppNexus's ad serving product was the only meaningful alternative to DFP that was worth considering for them. But switching to AppNexus would not have been a simple process and they viewed the switch as cost prohibitive. Q: And if -- did -- did The New York Time opine on what would happen if it did switch ad servers? A: Yes, they were concerned that if they used AppNexus that they would lose access and connection to Google demand and would have to switch back to a waterfall model rather than a realtime bidding model." Deposition of Trevor Young, Deputy Division Chief for the Antitrust Division, Office of the Attorney General of the State of Texas (May 24, 2024) at 203:25-204:13.

[245] "In this doc, Demand product [Yavin] allows all Google demand to buy from publishers ad server directly. We will work with publishers to ensure that Google demand has a fair access to as much quality inventory as possible through a direct publisher relationship with the ability to bid on a per query/impression basis." GOOG-AT-MDL-007234013 at 015. Apr. 2017. "go/demand-product-design-doc: go/yavin-dd" – Internal Google document.

[246] Emphasis included in original. GOOG-AT-MDL-001941178 at-179. Nov. 2017. "Demand Product Primer" - Internal Google presentation.

[247] "[redacted]." GOOG-AT-MDL-001941178 at-183. Nov. 2017. "Demand Product Primer" - Internal Google presentation by [redacted].

232. [redacted]

2) Non-discriminatory interoperability between Google Ads and third-party exchanges

233. In the context of Google Ads and third-party exchanges, a rule requiring non-discriminatory interoperability would require Google to allow Google Ads to bid into third-party exchanges – effectively ending the exclusivity of Google Ads to AdX. Google leverages Google Ads exclusivity to AdX to coerce publishers into either using DFP or forging access to Google Ads altogether. Non-discriminatory interoperability between Google Ads and third-party exchanges would decrease Google's ability to maintain a tie because publishers could access Google Ads demand on other exchanges through a third-party ad server.

234. Google Ads advertisers would benefit from non-discriminatory interoperability between Google Ads and third-party exchanges because they would have greater access to inventory. As I discuss in Section IX.B, exclusivity meant that Google Ads advertisers could miss inventory on

248 [redacted] Letter from David R. Pearl to Kelly Garcia, "Re: United States, et al. v. Google LLC, No. 1:23-cv-00108-LMB-JF A," October 6, 2023, p. 3

249 [redacted]." GOOG-TEX-00656701at-788. (09/10/2018). "dvaa: 2019 Strategy Book. Version 1" – Internal Google document.

250 [redacted]." GOOG-DOJ-AT-02274997 at -998. 2018. "What are the guiding principles and approaches for our publisher strategy, given the ecosystem changes?" – Internal Google document with contributors: [redacted]

251 [redacted] Letter from David R. Pearl to Kelly Garcia, "Re: United States, et al. v. Google LLC, No. 1:23-cv-00108-LMB-JFA," October 6, 2023, p. 3.

non-Google exchanges. With access to third-party exchanges, Google Ads advertisers would have more inventory available to them to make relevant matches.

235. Publishers also benefit from non-discriminatory interoperability for Google Ads and third-party exchanges. Currently, publishers can only access Google Ads from AdX and only access AdX from DFP. Publishers that do not contract with AdX would have access to demand from Google Ads through other exchanges if Google Ads became interoperable with third-party exchanges. Furthermore, if Google Ads demand is no longer exclusive to AdX, publishers could leave DFP for an ad server that best meets their needs without losing access to Google Ads demand.

236. Google already grants limited interoperability between Google Ads and third-party exchanges via its AwBid program. Google launched the AwBid program after recognizing that AdX did not provide sufficient inventory access for retargeting for its Google Ads advertisers. A 2012 presentation on AwBid stated that Google Ads had "been hurting in a very competitive remarketing field due to its complete dependence on AdX and AdSense inventory and a complete lack of reach into other exchanges."[252] Furthermore, AwBid's mission statement is [redacted]."[253] Google Ads exclusivity led to a restriction of relevant retargeting impressions that advertisers on Google Ad could achieve.

237. However, AwBid is not a wide-ranging enough interoperability solution for two main reasons. First, Google limits AwBid to specific impressions. It represents a small piece of Google Ads spend, [redacted].[254]

[252] *See* GOOG-DOJ-14430534 at 534. Google internal presentation – "Mini PRD – AdWords Cross Exchange Bidding (AwBid) 2012." [redacted], September 17, 2012.

[253] *See* GOOG-DOJ-14298902 at-905. Undated. "AwBid Overview" - Internal Google presentation.

[254] " [redacted]. GOOG-AT-MDL-006218257 at-264. Google's response to European Commission's RFI 10. December 16, 2023.

238. Interoperability between Google Ads and third-party exchanges lowers a barrier in the Publisher Ad Server Market by reducing the effectiveness of Google's tie. As I discuss in Section IX, publishers use the DFP ad server to access Google Ads demand. Publishers consider the impact of losing access to Google Ads in their decisions about what ad server to use, which is a barrier for rival ad servers. If Google Ads advertisers can participate on other exchanges, then publishers who do not contract with AdX could access Google Ads demand. Publishers also would no longer have to use DFP to access Google Ads demand and barriers in the Publisher Ad Server Market would decrease.

3) Non-discriminatory interoperability between DFP ad server and third-party exchanges

239. As I discuss in Section X.B, publishers benefit when exchanges compete simultaneously for impressions over sequential calling. Sequential calling of exchanges yields less revenue for publishers because all potential sources of demand are not competing on price at the same time to obtain the match to a publisher's impression.

240. Header Bidding is an example of technology that allows exchanges to compete simultaneously for impressions. Google was threatened by Header Bidding and Google's conduct with Header Bidding led to reduced exchange competition and lower marketplace efficiency for publishers.

241. A rule requiring non-discriminatory interoperability would require DFP to grant other exchanges the same privileges it grants AdX. For instance, a rule requiring non-discriminatory interoperability would not allow the 5% tax on exchanges using Exchange Bidding. The 5% tax puts exchanges at a disadvantage compared to AdX. Industry commentators noted that the third-party "SSPs in Exchange bidding will be at a disadvantage vs bids coming through Google's exchange" and that bids from third-party exchanges are "not competing on an even playing field with Google's exchange. For example, an advertiser $7 CPM bid through Header Bidding would be reduced to $6.64 through exchange bidding, assuming a 5% fee."[255]

[255] "SSPs in Exchange Bidding will be at a disadvantage vs. bids coming through Google's exchange. Since Google Ad Manager will now submit first-price bids, CPMs in Google's exchange will increase.
Bids coming from SSPs in Exchange Bidding are reduced due to the fee taken by Google for the Exchange Bidding service. As a result, these bids are not competing on an even playing field with Google's exchange. or example, an advertiser's $7 CPM bid through Header Bidding would be reduced to $6.65 through exchange bidding, assuming a 5% fee." GOOG-TEX-00091188 at-189. April 30, 2019. Email to

242. Google used its position in the ad server to decrease exchange competition by making it more difficult for publishers to use non-AdX exchanges. With Dynamic Allocation, Google gave AdX a privileged position at the top of the waterfall, which allowed AdX to win over other exchanges. Then, when publishers responded to Dynamic Allocation by adopting Header Bidding, Google continued to increase barriers for other exchanges by impeding publishers' use of Header Bidding. A rule requiring non-discriminatory interoperability would decrease the barriers.

243. Improving the interoperability between the ad server and other exchanges, or allowing Header Bidding to be a feasible option, would benefit publishers. Programs such as Header Bidding increase participation by increasing the number of available exchanges to compete for publisher inventory. In turn, increased participation increases marketplace efficiency because publishers are more likely to match with the bidder with the highest willingness to pay for the inventory.

244. A rule requiring non-discriminatory interoperability would also prevent future conduct similar to Last Look and Minimum Bid to Win, which gave AdX an advantage over Header Bidding auctions by revealing the winning price (Last Look) and not sharing winning prices with Header Bidding (Minimum Bid to Win).

4) Interoperability relies on publishers and advertisers having tools to make choices and monitoring to prevent the degradation of connections and features

245. Even if publishers and advertisers had improved interoperability between exchanges, they still need the tools' ability to make decisions and control for quality. For instance, UPR removes publishers' ability to maximize revenue and filter out low-quality exchanges.

246. Furthermore, publishers and advertisers also need access to data about the performance of auctions to make decisions. Publishers need to be able to evaluate the performance of exchanges, especially those involved in Header Bidding, as they were able to do before the redaction of the data transfer file. For advertisers and publishers, transparency in the auction,

Google employee containing an article from AdExchanger with subject "Google's Move to First-Price Auctions Will Likely Put A Dent In Header Bidding".

such as by providing information about bids submitted and fees collected, prevents conducts such as Bernanke that relies on obfuscation of relevant information.

247. If Google did improve interoperability between exchanges, ad servers, and ad buying tools, it would still have an incentive to degrade the extent of interoperability between tools. For instance, in its study on "Online Platforms and Digital Advertising," the UK competition regulator, Competition and Markets Authority (CMA), noted that Google had "taken steps that restrict the ability for other products and services to interoperate freely with their own."[256] Monitoring is thus required to prevent Google from degrading interoperability between tools.

248. Monitoring has been used in other cases where interoperability is a remedy. For instance, in *US v Microsoft*, a technical monitoring committee was part of the consent decree between Microsoft, the Department of Justice, and state plaintiffs.[257] As part of the remedy, a three-member technical committee comprised of software design and programming experts was appointed to assist in enforcement and compliance. Monitoring can ensure that interoperability commitments are upheld and not degraded over time.

D. Internal separation with best interest duties and firewalls lower barriers in the Ad Exchange Market

249. In addition to non-discriminatory interoperability, internal separation between Google's publisher ad server, ad exchange, and ad buying tools will help facilitate competition in the corresponding markets. Under an internal separation, DFP, AdX, Google Ads, and DV360 all would be separate business units. Each unit would have a best interested duty best interest duty to its customers (*e.g.*, DFP would have a best interest duty to publishers) and firewalls would be in place to prevent information sharing between units.

[256] "We have heard concerns that Google and Facebook have taken steps that that restrict the ability for other products and services to interoperate freely with their own: Facebook has in recent years degraded the access that other platforms and services have to its application programming interfaces (APIs). This has the effect of constraining the extent of interoperability between Facebook and other platforms, effectively shutting down the potential for competition. • Sonos has raised a concern about contractual terms that restrict the concurrent use of Google Assistant and Amazon's Alexa on Sonos smart speakers." UK CMA. "Online platforms and digital advertising – Market study final report." Accessed on June 4, 2024. Available at https://assets.publishing.service.gov.uk/media/5fa557668fa8f5788db46efc/Final_report_Digital_ALT_TEXT.pdf

[257] D.D.C. States Remedy 2002, 224 F. Supp. 2d at 268 (MSFT Consent Decree Section III.D), required Microsoft to disclose on a non-discriminatory basis the APIs "used by Microsoft Middleware to interoperate with a Windows Operating System Product." The decree also called for non-discriminatory disclosure of certain communication protocols. See id. at 269 (Section III.E).

250. Best interest duties and firewalls lower barriers in the Ad Exchange Market by reducing the incentive for Google to act in a manner that harms its customers. Best interest duties should align the tool in acting in the best interest of its customers, for instance, by allowing easy access to multiple exchanges. Firewalls protect the best interest duty by removing the ability to share sensitive data that would go against customer interests, for instance, removing information advantages DFP can give AdX.

1) Best interest duties align a tool's incentives with its customer's incentives

251. Best interest duties would be a part of internal separation. Best interest duties require agents to make decisions on behalf of their customers and follow guidelines to protect the customer from the agent's conflicts of interest.[258] Google would not be able to put its interests ahead of the interests of its customers. As I discuss in Sections IX – XII, Google has a history of acting on conflicts of interest to the detriment of its customers.

252. Best interest duties and their underlying principles have been extensively applied in financial markets to protect consumers from agents' conflicts of interest. For instance, registered investment advisers have a fiduciary duty to act in the best interests of their customers when providing investment advice.[259] Broker dealers also have an obligation to act in the best interest of their retail customers and not to place their own interest ahead of the retail customer's interest.[260]

253. Under a best interest duty on DFP, the ad server would be required to operate in the best interest of its publisher customers. A publisher aims to maximize revenue while maintaining a

[258] Financial markets are example of markets where best interest duties have been implemented. The Securities and Exchange Commission adopted the Regulation Best Interest rule which required broker-dealers to act in the best interest of the retail customer's interest. *See* https://www.sec.gov/info/smallbus/secg/regulation-best-interest. Accessed on June 4, 2024

[259] "As an investment adviser, you are a "fiduciary" to your advisory clients. This means that you have a fundamental obligation to act in the best interests of your clients and to provide investment advice in your clients' best interests. You owe your clients a duty of undivided loyalty and utmost good faith. You should not engage in any activity in conflict with the interest of any client, and you should take steps reasonably necessary to fulfill your obligations." SEC information sheet containing general information about certain provisions of the Investment Advisers Act of 1940. *See* https://www.sec.gov/divisions/investment/advoverview.htm. Accessed on June 4, 2024

[260] The SEC implemented Regulation Best Interest or "Reg. BI" in 2019 which "imposes a new standard of conduct specifically for broker-dealers that substantially enhances their obligations beyond the current "suitability" requirements. The standard can be viewed as having two components. First, it establishes a general obligation that draws from key fiduciary principles, requiring broker-dealers to act in the best interest of their retail customers and not place their own interest ahead of the retail customer's interest. Second, it includes specific requirements to address aspects of the broker-dealer relationship where our experience indicated that focused attention was appropriate. More specifically, Reg. BI is satisfied only if the broker-dealer complies with four specified component obligations: Disclosure, Care, Conflict of Interest, and Compliance. Speech by former SEC Chairman Jay Clayton. *See* https://www.sec.gov/news/speech/clayton-regulation-best-interest-investment-adviser-fiduciary-duty#_ftn1 Accessed on June 4, 2024

commensurate level of quality for its website.[261] Requirements under a best interest duty for publishers include giving publishers choice to opt-in or out of programs.

254. For instance, UPR benefits AdX against the interests of publishers, because UPR lowers reserves for AdX, but publishers use high reserves as a way to protect against low quality demand. In addition, publishers, not Google, are in the best position to make decisions regarding their own inventory and determine a reserve price with an appropriate tradeoff between price and quality. Under a best interest duty, publishers would be able to opt-in or out of UPR. Likewise, under a best interest duty, publishers would be able to opt-in or out of EDA, as publishers are in the best position to determine whether AdX and other exchanges can compete against their direct deal inventory. In addition, a best interest duty for publishers would maintain non-discriminatory interoperability between DFP and third-party exchanges. As I discuss in Section X.B, publishers maximize revenue when multiple exchanges can compete for an ad slot. As a result, a best interest duty would maintain interoperability connections.

255. Under a best interest duty on AdX, the exchange would be required to operate in the best interest of its publisher and advertiser customers. Requirements would include running a transparent and fair auction. Under the duty, AdX would be required to make the auction rules clear to publishers and advertisers. An example of clear auction rules includes disclosing programs such as DRS and RPO to publishers and advertisers so they may respond accordingly. In addition, a best interest duty for AdX would require AdX not to grant special information or access to specific publishers or advertisers that is not offered to others. In addition, a best interest duty for AdX publishers would maintain non-discriminatory interoperability between third-party ad servers and AdX. Publishers on third-party ad servers are customers of AdX, and require equal access to AdX as DFP.

256. Under a best interest duty for Google Ads and DV360, Google's buying tools would be required to operate in the best interests of advertisers. Advertisers want to maximize their return on investment by displaying ads to users who are likely to make a purchase. Under the duty, buying tools would be required to make the bidding rules clear to advertisers. For instance,

[261] An internal presentation describes that [redacted] GOOG-AT-MDL-015238842 at-846. Oct. 2019. "DoubleClick Ad Exchange" - [redacted] - DoubleClick Ad Exchange - Internal Google Presentation.

programs such as Bernanke would need to be disclosed to Google Ads advertisers so they may respond accordingly.

257. In addition, a best interest duty for publishers would maintain non-discriminatory interoperability between Google Ads and third-party exchanges. As I discuss in Section IX.B, advertisers benefit when they have greater access to inventory. As a result, a best interest duty would maintain interoperability connections.

258. Best interest duties can lower barriers to exchange competition by restoring choice to publishers and advertisers and aligning interests between customers and tools. Aligning interests between tool and customers supports the market design principles of straightforward incentives. Publisher and advertisers can choose which exchanges to work with and exchanges can compete for publisher inventory and advertiser demand by offering better prices and services.

259. However, a weakness of best interest duties is they require extensive monitoring to ensure that best interest commitments are upheld. For instance, if Google launched a new, secret program on its publisher ad server that was in violation of publishers' best interests, publishers have no way to detect and stop the program from launching.

2) Firewalls strengthen the implementation of internal separation and enable fair access to information

260. Internal separation would also require data firewalls between the publisher ad server, ad exchange, and ad buying tools. Firewalls would limit communication and data sharing between groups and would reinforce internal separation by preventing asymmetric access to information available to Google and third-party advertising tools.

261. Firewalls have been adopted in financial markets and antitrust merger decisions to enforce separation between entities and ensure compliance. For instance, as part of Glass Stegall,[262] firewalls have been instituted to restrict transactions, information flows, and shared management personnel between the commercial banking and investment banking activities of

[262] 1933 Glass Steagall Act mandated the separation of commercial banks and investment banks

a firm.[263] Firewalls are commonly employed by industries such as banking, consulting, and law to manage conflicts of interest and prevent the exchange of sensitive information for legal or ethical reasons.[264]

262. Firewall provisions have also been adopted by antitrust authorities in merger decisions to minimize the risk that the integrated firm would use information to disadvantage a rival competitor or to restrict communications that may facilitate coordination between upstream competitors, resulting in a reduction in competition.[265] As part of its acquisition of Fitbit, Google agreed to the European Commission's stipulation of maintaining technical separation of Fitbit user data for a period of 10 years by storing it in a data silo and not using it for advertising purposes.[266]

263. Given the unification of DFP and AdX, data firewalls are important between the entity that houses the publisher ad server and the entity that houses the ad exchange to prevent the exchange using information from the publisher ad server to skew outcomes in its favor. For instance, Google's implementation of Dynamic Allocation and Last Look used this information asymmetry to benefit its own exchange by passing the highest bid available from remnant line items as a floor for the AdX auction to beat,[267] and now, publishers' Minimum Bid to Win Data is

[263] "…the Fed also erected a number of "firewalls" between the securities subsidiary and the bank owned by the same holding company. […] These firewalls are aimed at preventing conflicts of interest between the securities subsidiary and the commercial bank, the primary concerns that led to the passage of the Glass-Steagall Act in the first place. By restricting transactions, information flows, and shared management between the securities subsidiary and the commercial bank, the firewalls also safeguard the banking system and prevent securities affiliates from tapping the safety net that is available exclusively to commercial banks."

[264] Ethical walls refers to a set of information sharing protocols that restrict the sharing of information between business units.

[265] "Firewalls are designed to prevent the dissemination of information within a firm. For example, if an upstream monopolist proposes to merge with one of three downstream firms that compete against one another, the Division may be concerned that the upstream firm will share information with its acquired downstream firm (and perhaps with the two other downstream firms) to facilitate anticompetitive behavior. The Division also may be concerned that information shared by an upstream firm with its downstream subsidiary will be communicated to competing upstream firms with which the downstream subsidiary deals. Such communications may in some instances facilitate coordination between upstream competitors. A firewall could prevent these problems. *See* U.S. Department of Justice. Antitrust Division Policy Guide to Merger Remedies. June 2011 at Page 13. Note: All Merger Remedies Manual have been withdrawn or superseded (2020, 2011, and 2004). "For example, when the Coca-Cola Company and PepsiCo Inc bought their largest bottlers, the FTC was concerned that the vertical mergers would provide Coke and Pepsi with competitor information about Dr Pepper Snapple Group, the third-largest competitor in the industry. The FTC imposed a firewall within each company to prevent bottling employees from sharing competitively sensitive information with the Coke and Pepsi employees involved in producing the respective flavours." *See* Merger Remedies Guide, Second Edition. Available at https://www.weil.com/~/media/files/pdfs/2019/nonstructural-remedies.pdf. *See also* The Coca-Cola Company, 75 Fed Reg 61,141 (FTC 4 October 2010); PepsiCo Inc, 75 Fed Reg 10,795 (FTC 26 March 2010)

[266] *See* European Commission press release. 17, December 2020. "Mergers: Commission clears acquisition of Fitbit by Google, subject to conditions." Accessed on June 4, 2024. Available at https://ec.europa.eu/commission/presscorner/detail/en/ip_20_2484.

[267] "Because AdX has a direct integration into DFP, it knows that, when it runs its auction, it only needs to beat the publisher assigned price of $1.00 to win […] As long as AdX has an eligible bid, it wins and pays the publisher the requisite $1.01. This process is known as last look and you can see how this auction mechanic is attractive to buyers who are considering which exchange to work with." GOOG-AT-MDL-013987096 at-102. "Publisher Monetization 101." – Internal Google presentation by [redacted].

shared to Exchange Bidding buyers and not Header Bidding buyers.[268] RPO also uses AdX data to overrule publisher floors.[269]

264. Firewalls can prevent future anticompetitive conduct by limiting data that can be shared across tools for experiments. Cross-tool data is used as a part of Google's experiments. Before Google launches a new program, it runs experiments to test the impact of the new program. A data firewall would limit available data for experiments to a single tool. As a result, Google would not have information about cross-tool impact when launching programs, and would have to launch programs that maximize gains for a single tool. For instance, on small ad buying tool programs such as Bernanke, a firewall would prevent Google from making decisions based on the impact to publishers, rather than their customers, the advertisers.[270]

265. Firewalls on experiments would also prevent Google from coordinating on the interaction between programs in different business units. For instance, before the launch of DRS v1, an AdX program, AdX engineers worked with the GDN team to understand how DRS would interact with Bernanke and how Bernanke would adapt to DRS. Under firewalls, teams would have to launch programs that are in the best interest of their customers without the knowledge of how they would interact with other programs.

266. Firewalls support best interest duties, which in turn increases the market design principles of straightforward incentives for participation by aligning the interests of the tool to the interests of the customers. Aligning incentives between tools and customer can reduce barriers in the Ad Exchange Market, because participants can choose which exchanges to use.

E. Disclosure of transaction data and routing practices resolve transparency issues

267. As I have discussed, marketplaces are generally safer when participants understand the rules and, in the context of display advertising, can bid according to the auction rules. By not

[268] "Ad Manager provides the "minimum bid to win" for each impression, but that figure is disclosed only ex-post, and it is provided equally to all buyers in the unified first-price auction." GOOG-TEX-01008317 at-321. 2019. "Digital Advertising Market Study Follow-up to Google/CMA meeting on 28 October 2019"

[269] GOOG-NE-06151351 at-351. Nov. 11, 2015. "Monetization-pm" Re: [drx-pm] LAUNCHED! Dynamic Pricing (RPO) for AdX sellers - Internal Google launch email.

[270] An internal Google document shows that Google considered and measured impact to publishers while designing experiments such as Bernanke for its advertiser tools. *See* GOOG-NE-13624783 at-788,789.

revealing the auction rules in Google's deceptive conduct, Google prevented customers from realizing the full benefits of participating in auctions. Instead, Google reaped the benefits of its conduct at the expense of its customers. Transparency can be increased if publisher and advertiser customers can request data from Google that is sufficient to audit Google's conduct.

268. Improving transparency will lower barriers in the Ad Exchange Market. Google's deceptive conduct allowed AdX to win more. However, if publisher and advertisers knew how the deception changed the rules of the auction, they could change their behavior. If publishers and advertisers knew the rules of the auction, they may choose to set floors or bids in a way where another exchange would win over AdX.

269. Practical remedies exist to improve transparency for customers. Google should provide its publisher and advertiser customers with sufficient data to determine that the tool is following stated auction rules and that the tool is acting in the best interest of customers. Publishers and advertisers should be able to request (1) disclosure of transaction data for publishers and (2) disclosure of routing practices for publishers and advertisers.

270. Disclosure of transaction data for publishers would allow publishers to request bid transaction data from AdX that includes, for all impressions, all bids submitted on the impression, floor used on the impression, publisher payout, and associated take rate for the impression. Transaction data would remain anonymized to not implicate user privacy. With access to bid and take rate data, publishers would be better positioned to audit deviations from the stated auction rules.

271. Disclosure of transaction data for advertisers would allow advertisers to request bid transaction data from Google Ads or DV360 that includes, for all impressions, the bid submitted to the internal auction (*e.g.*, Google Ads auction), the bid submitted to the AdX exchange, the bid submitted to a third-party exchange, and the result of the auction. With access to bid transaction data, advertisers would be better positioned to audit deviations from the stated bidding procedures. In addition, by comparing internal auction bids with AdX or third-party exchanges, advertisers can audit how the advertiser tool bid shades across exchanges.

272. Disclosure of transaction data (bids submitted by different parties) can facilitate price comparison (for advertisers) and yield comparison (for publishers) across exchanges and

improve the ability of advertisers and publishers to evaluate the performance of exchanges. As I discuss in Section X.B, Google limited publishers' ability to measure the performance of Header Bidding as a demand source by redacting data fields from the Bid Data Transfer file. Effective disclosure of transaction data allows publishers and advertisers to evaluate performance of demand and supply sources in Publisher Ad Server, Ad Exchange, and Ad Buying Tool Markets in the future.

273. The corporate bond market and other over-the-counter financial markets are settings where marketplaces have adopted reforms encouraging transparency. For the corporate bond market, marketplace transparency is seen as valuable because "timely access to relevant information about secondary trading allows investors to better look after their own interests and reduces the risk of manipulative or other unfair trading practices."[271] In my own work, I have studied how giving corporate bond market participants more information about the trades in the marketplace has resulted in lower transaction costs.[272]

274. In addition, disclosure of routing practices for publishers would allow publishers to request the routing logic from the ad server on how the ad server compares demand sources in an auction and the criteria used for serving impression; for instance, when AdX wins over a direct deal. Publishers can then make informed choices by evaluating their preferences for ad serving against the policies of the ad server and expectations on where impressions are likely to be routed.

275. Disclosure of routing practices has been implemented in financial markets to enable customers to better understand how their firm routes and handles orders, assess the quality of order handling services, and whether the firm is effectively managing conflicts of interest that may impact routing decisions. [273]

[271] "Transparency of Corporate Bond Markets" OICU-IOSCO, May 2004 at page https://www.iosco.org/library/pubdocs/pdf/IOSCOPD168.pdf , Accessed on June 7, 2024

[272] Asquith, P, Thomas Covert, and Parag Pathak., (2013), "The Effects of Mandatory Transparency in Financial Market Design: Evidence from the Corporate Bond Market." NBER Working Paper, 19417; https://www.nber.org/system/files/working_papers/w19417/w19417.pdf, Accessed on June 7, 2024

[273] Disclosure of routing practices has been implemented in financial markets to enable customers to better understand how their firm routes and handles orders, assess the quality of order handling services, and whether the firm is effectively managing conflicts of interest that may impact routing decisions. *See* SEC Rule on Disclosure of Order Handling Information. Available at https://www.sec.gov/news/press-release/2018-253. Accessed on June 1, 2024

276. Disclosure of transaction data and routing practices can give publishers and advertisers access to information that allows them to audit auction results and auction programs. If publishers and advertisers detect that Google has changed the auction rules or routes impressions against their interests, they would have a reason to stop using Google's tools.

277. While a well-functioning marketplace should have transparent disclosure of transaction data and routing rules, they do not solve the potential for Google to launch future deceptive conduct that could not be tracked by such disclosures.

Appendix A: Curriculum Vitae of Parag A. Pathak

Parag A. Pathak

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Education

Ph.D., Harvard, Business Economics, 2003-2007.
S.M., Harvard, Applied Mathematics, 2002.
A.B., Harvard, *summa cum laude* in Applied Mathematics, 2002.

Current Employment

Massachusetts Institute of Technology
- Class of 1922 Professor of Economics, 2020-.
- Jane Berkowitz Carlton and Dennis William Carlton
  - Professor of Microeconomics, 2016-2020.
- Professor of Economics, 2014-.
- Associate Professor of Economics (with Tenure), 2011-2014.
- Economics Career Development Assistant Professor of Economics, 2009-2011.
- Assistant Professor of Economics, 2008-2009.

National Bureau of Economic Research
- Co-director (and founder), Working Group on Market Design, 2008-.
- Faculty Research Fellow, 2008-2011.
- Faculty Research Associate, 2011-.

Former or Visiting Positions

Harvard University
- Junior Fellow, Society of Fellows, 2007-2009.

Stanford Graduate School of Business
- Visiting Assistant Professor of Economics, 2010-2011.

Harvard University
- Visiting Professor of Economics, 2015-2016.

Microsoft Research New England
- Weekly Visitor, 2015-2016.

Honors and Awards

MIT Graduate Economics Association, Teacher of the Year, 2022.
Fellow of the Society for the Advancement of Economic Theory, 2021.
Named by *Science News* as one of the Top 10 Young Scientists to Watch, 2019.
John Bates Clark Medal, American Economic Association, 2018.
Fellow of the American Academy of Arts and Sciences, 2018.
Named by the *Economist* as one of the decades top eight young economists, 2018.
Fellow of Econometric Society, 2016.
Social Choice and Welfare Prize, Society for Social Choice and Welfare, 2016.
Named one of the top 25 Economists under age 45 by the IMF, 2014.
NSF Presidential Early Career Award for Scientists and Engineers, 2012.
Alfred P. Sloan Research Fellow, 2012-2013.
Undergraduate Economics Association's Teaching Award, 2010.
Hernstein Prize for Best Dissertation in Social Sciences at Harvard, 2007.
Review of Economic Studies Tour, 2007.
State Farm Companies Doctoral Dissertation Award, 2006.
George S. Dively Award for Outstanding Pre-Dissertation Research, 2005.
National Science Foundation Graduate Research Fellowship, 2003.
Paul and Daisy Soros Fellowship for New Americans, 2003.
Chateaubriand Fellowship (Ambassade de France), 2002.
Phi Beta Kappa, Thomas T. Hoopes Prize, 2002.

Professional Activities

Co-editor, *Econometrica*, 2023-2027.

National Bureau of Economic Research, Founding Co-director, Working Group on Market Design, 2008-.

MIT Blueprint Labs, Founder and Director, 2012-.

Avela Education, Chief economist and co-founder, 2020-.

MIT Integrated Learning Initiative, Deputy Director, 2016-2022

Associate Editor, *Journal of Political Economy*, 2016-2019; 2019-2022.

Editorial Board, *Education Finance and Policy*, 2014-2017; 2017-2019.

Associate Editor, *Econometrica*, 2013-2016.

Associate Editor, *American Economic Review*, 2012-2015; 2015-2017.

NSF Review Panel, 2012.

Boston Mayor Menino's Technical Advisor for Student Assignment Plan, Boston Public Schools, 2012.

Member of Scientific Board, Institute for Innovation in Public School Choice, 2007-2019.

Refereed Journal Publications

1. "Short Interest, Institutional Ownership, and Stock Returns." *Journal of Financial Economics*, November 2005, 78: 243-276. (with Paul Asquith and Jay Ritter)

2. "Leveling the Playing Field: Sincere and Sophisticated Players in the Boston Mechanism." *American Economic Review*, September 2008, 98(4), 1636-52. (with Tayfun Sönmez)

3. "Incentives and Stability in Large Two Sided Matching Markets." *American Economic Review*, June 2009, 99(3), 608-627. (with Fuhito Kojima)

4. "Strategyproofness versus Efficiency in Matching with Indifferences: Redesigning the NYC High School Match." *American Economic Review*, December 2009, 99(5): 1954-1978. (with Atila Abdulkadiroğlu and Alvin E. Roth)

5. "Unobserved Punishment Supports Cooperation." (with Drew Fudenberg), *Journal of Public Economics*, February 2010, 94(1-2): 78-86.

6. "Lotteries in Student Assignment: An Equivalence Result." (with Jay Sethuraman), *Theoretical Economics*, January 2011, 6(1): 1-17.

7. "Accountability and Flexibility in Public Schools: Evidence from Boston's Charters and Pilots." (with Atila Abdulkadiroğlu, Joshua D. Angrist, Susan M. Dynarski, and Thomas J. Kane) *Quarterly Journal of Economics*, May 2011, 126(2), 699-748.

8. "Cooperation over Finite Horizons: a Theory and Experiments." (with Attila Ambrus) *Journal of Public Economics*, August 2011, 95(1-2), 500-512.

9. "Forced Sales and House Prices." (with John Campbell and Stefano Giglio) *American Economic Review*, August 2011, 101(5): 2108-2131.

10. "Who Benefits from KIPP?" (with Joshua D. Angrist, Susan M. Dynarski, Thomas J. Kane, and Chris Walters) *Journal of Policy Analysis and Management*, Fall 2012, 31(4): 837-860.

11. "The Market for Borrowing Corporate Bonds." (with Andrea Au, Paul Asquith, Thomas Covert) *Journal of Financial Economics*, January 2013, 107(1): 155-182.

12. "School Admission's Reform in Chicago and England: Comparing Mechanisms by their Vulnerability to Manipulation." (with Tayfun Sönmez), *American Economic Review*, February 2013, 103(1): 80-106.

13. "Matching with Couples: Stability and Incentives in Large Markets." (with Fuhito Kojima and Alvin Roth), *Quarterly Journal of Economics*, October 2013, 128(4): 1585-1632.

14. "Explaining Charter School Effectiveness." (with Joshua D. Angrist and Christopher Walters), *American Economic Journal: Applied Economics*, October 2013, 5(4): 1-27.

15. "The Elite Illusion: Achievement Effects at Boston and New York Exam Schools." (with Atila Abdulkadiroğlu and Joshua D. Angrist) *Econometrica*, 2014, 82(1): 137-196.

16. "Housing Market Spillovers: Evidence from the End of Rent Control in Cambridge MA." (with David H. Autor and Christopher J. Palmer), *Journal of Political Economy*, June 2014, 122(3): 661-717.

17. "The Cost of Free Entry: An Empirical Study of Real Estate Agents in Greater Boston." (with Panle Jia Barwick) *Rand Journal of Economics*, 46(1): 103-145, Spring 2015.

18. "How Individual Preferences are Aggregated in Groups: An Experimental Study." (with Attila Ambrus and Ben Greiner) *Journal of Public Economics*, 129(C): 1-13, September 2015.

19. "Stand and Deliver: Effects of Boston's Charter High Schools." (with Joshua D. Angrist, Sarah R. Cohodes, Susan M. Dynarski, and Christopher R. Walters) *Journal of Labor Economics*, 34(2), 275-318, 2016.

20. "Charters without Lotteries: Testing Takeovers in New Orleans and Boston." (with Atila Abdulkadiroğlu, Josh Angrist, and Peter Hull) *American Economic Review*, 106(7): 1878-1920, July 2016.

21. "Leveraging Lotteries for School Value-Added: Testing and Estimation." (with Josh Angrist, Peter Hull, and Christopher Walters), *Quarterly Journal of Economics*, 132(2): 871-919, May 2017.

22. "Conflicts of Interest and the Realtor Commission Puzzle." (with Panle Jia Barwick and Maisy Wong), *American Economic Journal: Applied Economics*, 132(2): 871-919, July 2017.

23. "Research Design meets Market Design: Using Centralized Assignment for Impact Evaluation." (with Atila Abdulkadiroğlu, Josh Angrist, and Yusuke Narita), *Econometrica*, September 2017, 85(5): 1373-1432.

24. "The Welfare Effects of Coordinated School Assignment: Evidence from the NYC High School Match." (with Atila Abdulkadiroğlu and Nikhil Agarwal), *American Economic Review*, December 2017, 107(12): 3635-3689.

25. "Free to Choose: Can School Choice Reduce Student Achievement?" (with Atila Abdulkadiroğlu and Christopher Walters), *American Economic Journal: Applied Economics*, January 2018, 10(1): 175-206.

26. "Reserve Design: Unintended Consequences and The Demise of Boston's Walk Zones." (with Umut Dur, Scott Kominers, and Tayfun Sönmez), *Journal of Political Economy*, December 2018, 126(6): 2457-2479.

27. "Do Parents Value School Effectiveness?" (with Atila Abdulkadiroğlu, Jon Schellenberg, and Chris Walters), *American Economic Review*, 2020, 110(5): 1502-1539.

28. "Explicit vs. Statistical Preferential Treatment in Affirmative Action: Theory and Evidence from Chicago's Exam Schools." (with Umut Dur and Tayfun Sönmez), *Journal of Economic Theory*, 2020, 187, 104996.

29. "Minimizing Justified Envy in School Choice: The Design of New Orleans OneApp." (with Atila Abdulkadiroğlu, Yeon-Koo Che, Alvin E. Roth, and Olivier Tercieux), *American Economic Review: Insights*, 2020, 2(4): 425-442.

30. "Improving Ventilator Rationing Through Collaboration with Experts on Resource Allocation." (with Tayfun Sönmez and M. Utku Ünver), *JAMA Network Open*, 2020; 3(6):e2012838.

31. "Covid-19: How to Prioritize Worse-off Populations in Allocating Safe and Effective Vaccines." (with Harald Schmidt, Tayfun Sönmez, and Utku Ünver), *British Medical Journal*, 2020; 371:m3795.

32. "How Well Do Structural Demand Models Work? Counterfactual Forecasting in School Choice." (with Peng Shi), *Journal of Econometrics*, 2021, 222, 161-195.

33. "The Distributional Consequences of Public School Choice." (with Chris Avery), *American Economic Review*, 2021, 111(1): 129-152.

34. "The Efficiency of Race-Neutral Alternatives to Race-Based Affirmative Action: Evidence from Chicago's Exam Schools." (with Glenn Ellison), *American Economic Review*, 2021, 111(3): 943-975.

35. "Categorized Priority Systems: A New Tool for Fairly Allocating Scarce Medical Resources in the Face of Profound Social Inequities." (with Tayfun Sönmez (lead), M. Utku Ünver, Govind Persad, Robert D. Truog, and Douglas B. White), *CHEST*, 159(3): 1294-1299, March 2021.

36. "Reserve Systems for Allocation of Scarce Medical Resources During the COVID-19 Pandemic: The Path From April 2020 to April 2021, (joint with Tayfun Sönmez and M Utku Ünver), *CHEST*, 160:4, 1572-1575, October 2021.

37. "A Novel Approach to Equitable Distribution of Scarce Therapeutics: Institutional Experience Implementing a Reserve System for Allocation of COVID-19 Monoclonal Antibodies," (with Emily Rubin, Scott L Dryden-Peterson, Sarah P Hammond, Inga Lennes, Alyssa R Letourneau, Tayfun Sönmez, and M. Utku nver), *CHEST*, 160:6, 2323-31, December 2021.

38. "Breaking Ties: Regression Discontinuity Design meets Market Design." (with Atila Abdulkadiroğlu, Josh Angrist, and Yusuke Narita), January 2022, 90(1): 117-151. *Econometrica*.

39. "Deduction Dilemmas: The Taiwan Assignment Mechanism." (with Umut Dur, Fei Song, and Tayfun Sönmez), February 2022, *American Economic Journal: Microeconomics*, 14(1): 164-185.

40. "Reserve System Design for Allocation of Scarce Medical Resources in a Pandemic: Some Perspectives from the Field" (with Govind Persad, Tayfun Sönmez, and M. Utku Ünver), *Oxford Review of Economic Policy*, 38(4), 924-940, 2022.

41. "Reversing Reserves." (with Alex Rees-Jones and Tayfun Sönmez), *Management Science*, 69(11), 6940-6953, 2023.

42. "A Multi-Center Weighted Lottery to Equitably Allocate Scarce COVID-19 Therapeutics, (with Douglas White, Erin McCreary, Chung-Chou Ho Chang, Mark Schmidhofer, Robert Truog, Govind Persad, Naudia Jonassaint, Tayfun Sönmez, and M. Utku Ünver), *American Journal of Respiratory and Critical Care Medicine*, 206(4), 503-506, August 2022.

43. "Immigration Lottery Design: Engineered and Coincidental Consequences of H-1B Reforms." (with Alex Rees-Jones and Tayfun Sönmez), *Review of Economics and Statistics*, 1-43, September 2022.

44. "The Long-Term Effects of Universal Preschool in Boston." (with Guthrie Gray-Lobe and Christopher R. Walters), *Quarterly Journal of Economics*, 138(1), 363-411, 2023.

45. "Choice and Consequence: Assessing Mismatch at Chicago Exam Schools." (with Josh Angrist and Roman Zárate), *Journal of Public Economics*, 223, 104892, 2023.

46. "Weighted Lottery to Equitably Allocate Scarce Supply of COVID-19 Monoclonal Antibody." (with Erin K. McCreary, Utibe Essien, Chung-Chou H. Chang, Rachel A. Butler, Tayfun Sönmez, M. Utku Ünver, Ashley Steiner, Maddie Chrisman, Derek C. Angus, Douglas B. White), *JAMA Health Forum*, 4(9), September 2023.

47. "Simple and Credible Value-Added Estimating Using Centralized School Assignment." (with Josh Angrist, Peter Hull, and Christopher R. Walters), December 2020, forthcoming, *Review of Economics and Statistics*.

48. "Race and the Mismeasure of School Quality" (with Joshua D. Angrist, Peter Hull, and Christopher R. Walters), December 2021, NBER Working Paper 29608, forthcoming, *American Economic Review: Insights*.

49. "Fair Allocation of Vaccines, Ventilators, and Antiviral Treatments: Leaving No Ethical Value Behind in Health Care Rationing." (with Tayfun Sönmez, M. Utku Ünver, and M. Bumin Yenmez), NBER Working Paper 26951, 2020, forthcoming, *Management Science*.

50. "Mechanism Design meets Priority Design: Redesigning the US Army's Branching Process." (with Kyle Greenberg and Tayfun Sönmez), NBER Working Paper 28911, November 2021, forthcoming, *American Economic Review*.

Other Publications

1. "The New York City High School Match." *American Economic Review, Papers & Proceedings*, May 2005, 364-367. (with Atila Abdulkadiroğlu and Alvin E. Roth)

2. "The Boston Public Schools Match." *American Economic Review, Papers & Proceedings*, May 2005, 368-371. (with Atila Abdulkadiroğlu, Alvin E. Roth, and Tayfun Sönmez)

3. "The Dynamics of Open-Source Contributors." *American Economic Review, Papers & Proceedings*, May 2006, 114-118. (with Josh Lerner and Jean Tirole)

4. "The Impact of Commissions on Home Sales in Greater Boston." *American Economic Review, Papers & Proceedings*, May 2010. (with Panle Jia)

5. "Inputs and Impacts in Charter Schools: KIPP Lynn." *American Economic Review, Papers & Proceedings*, 100(2), 239-243, May 2010. (with Joshua D. Angrist, Susan M. Dynarski, Thomas J. Kane, and Chris Walters)

6. "The Mechanism Design Approach to Student Assignment." *Annual Reviews of Economics*. Volume 3: 513-536, 2011.

7. Discussion of "The Missing One-Offs: The Hidden Supply of High-Achieving, Low-Income Students" by Chris Avery and Caroline Hoxby. *Brookings Papers on Economic Activity*, Spring 2013.

8. Discussion of "Evaluating Policies to Prevent Another Foreclosure Crisis" by Paul Willen. *Cato Papers on Public Policy*, Spring 2013.

9. "Interpreting Tests of School VAM Validity." *American Economic Review, Papers & Proceedings*, 106(5), 388-392, May 2016. (with Josh Angrist, Peter Hull, Christopher Walters)

10. "What Really Matters in Designing School Choice Mechanisms," in Bo Honore, Ariel Pakes, Monika Piazessi, Larry Samuelson, eds. *Advances in Economics and Econometrics, 11th World Congress of the Econometric Society*, Cambridge University Press, 2017.

11. "Regression Discontinuity in Serial Dictatorship: Achievement Effects at Chicago's Exam Schools." *American Economic Review, Papers & Proceedings*, 107(5), 240-245, May 2017. (with Atila Abdulkadiroğlu, Josh Angrist, Yusuke Narita, and Roman Zárate)

12. "Ending Rent Control Reduced Crime in Cambridge." *American Economic Review, Papers & Proceedings*, 109, 381-384, May 2019 (with David H. Autor and Christopher J. Palmer)

Working Papers and Work in Progress

1. "From Immediate Acceptance to Deferred Acceptance: Effects on School Admissions and Achievement in England" (with Camille Terrier and Kevin Ren), December 2021, NBER Working Paper 29600, revise-and-resubmit, *American Economic Journal: Applied Economics*.

2. "Still Worth the Trip?" School Busing Effects in Boston and New York." (with Joshua Angrist, Guthrie Gray-Lobe, and Clemence Idoux), July 2022, NBER Working Paper 30308.

3. "The Economics of the Common Application." (with Chris Avery and Geoff Kocks), December 2022.

4. "Rationing Safe and Effective COVID-19 Vaccines: Allocating to States Proportionate to Population May Undermine Commitments to Mitigating Health Disparities." (with Harald Schmidt, Michelle Williams, Tayfun Sönmez, M. Utku Ünver, Lawrence Gostin), November 2020.

5. "What Prioritizing Worse-Off Minority Groups for COVID-19 Vaccines Means Quantitatively: Practical, Legal, and Ethical Implications." (with Harald Schmidt, M. Utku Ünver, Michelle Williams, Tayfun Sönmez, and Lawrence Gostin)

6. "Paying it Backward and Forward: Expanding Access to Convalescent Plasma Therapy through Market Design." (with Scott D. Kominers, Tayfun Sönmez, M. Utku Ünver), May 2020, NBER Working Paper 27143.

7. "Priority-Based Matching with a Social Objective: Contract Design for Access and Equity." (with Umut Dur, Arda Gitmez, and Tayfun Sönmez), March 2018.

8. "The Effects of Mandatory Transparency in Financial Market Design: Evidence from the Corporate Bond Market." (with Paul Asquith and Thomas Covert), NBER Working Paper 19417, September 2014, revised March 2019.

9. "Optimal Curricula, Student Achievement, and the Regression Discontinuity Design." (with Glenn Ellison), April 2017.

Research Grants

Smith-Richardson Foundation, "Long-Run Impacts of Texas Charter School Attendance," SRF grant #2022-2677, 2022-2025.

W. T. Grant Foundation, "Understanding the Impact of Integration Policies in New York City Schools," 2020-2023.

Spencer Foundation, "Understanding the Impact of Integration Policies in New York City Public Schools," 2020-2022.

Walton Family Foundation, "Using Unified Enrollment Data to Grade School Effectiveness"' 2019-2022.

Walton Family Foundation, "The Impact of Boston Charters on Earnings: A Feasibility Study" 2019-2020.

The Michael and Susan Dell Foundation, "MIT School Access Fellows Program." 2019-2020.

Laura and John Arnold Foundation, "School Assignment and Accountability: Helping Policymakers Translate Student Assignment into School Effectiveness" 2018-2020.

Spencer Foundation, "Leveraging Lotteries for Value-Added," 2015-2017.

Walton Family Foundation, Post-doctoral support, 2016-2018.

William T. Grant Scholars Program, Early Career Award, 2015-2019.

MIT ESI Seed Grant, "Improved Management of Common Pool Resources: Water Market Design," 2015-2017.

National Science Foundation Research Grant, "Research Design meets Market Design," 2014-2017.

Laura and John Arnold Foundation, award to study affirmative action at Chicago Public Schools, 2014-2016.

National Science Foundation Research Grant, "Diversity and Transportation in School Choice," 2014-2016.

MIT-Chile Universidad Diego Portales Seed Fund, "Voucher Reform in Chile," 2014-2016.

Laura and John Arnold Foundation, award to study the New Orleans OneApp, 2013.

Boston Foundation - New Schools Venture Fund project on MA Charters, 2012-2013.

Institute for Education Sciences, Charter Schools; New Econometric Methods, 2012-2015.

National Science Foundation CAREER Research Grant, "From Assignment to Evaluation: The Design of School Choice Systems," Grant SES-1056325, 2011-2016.

National Science Foundation Research Grant, "Spillovers from Price Regulations: Evidence from Rent Control in Cambridge, MA" Grant SES-962572, 2010-2013.

Massachusetts Department of Elementary and Secondary Education contract to study charter Schools, 2009-10.

Harvard Real Estate Initiative Grant, 2010.

Lincoln Institute for Land Policy Research Grant, "Spillovers from Price Regulations: Evidence from Rent Control in Cambridge, Massachusetts," 2010.

Alfred P. Sloan Foundation Research Grant, "Spillovers from Price Regulations: Evidence from Rent Control in Cambridge, Massachusetts," 2009.

National Science Foundation Research Grant, "New Issues in Matching Market Design," Grant SES-924555, 2009-2012.

Harvard Milton Fund Research Grant, 2007.

Rappaport Institute for Greater Boston Fellow, 2007.

Q-Group Research Grant, 2006.

John R. Meyer Dissertation Fellowship, Joint Center for Housing Harvard, 2006.

Lincoln Institute for Land Economics Grant, 2005.

Spencer Foundation on Education Research Grant, 2005.

National Science Foundation Graduate Research Fellowship, 2003-2006.

Select Invited Plenary Talks

Robert Rosenthal Memorial Lecture, Boston University, 2023.
Johns Hopkins Distinguished Lecture, Johns Hopkins, 2023.
Henry George Lecture, University of Scranton, 2022.
Plenary address, Stony Brook International Game Theory Conference, 2020.
Keynote speaker, Matching in Practice Workshop, Gothenberg, Sweden, 2019.
Keynote speaker, 2019 Asian Meeting of Econometric Society, Xiamen, China, 2019.
Keynote speaker, Economics of Markets and Organizations, Toronto, 2018.
Keynote speaker, 13th Conference on Web and Internet Economics, Bangalore, India 2017.
Keynote speaker, 10th Conference on Economic Design, in York, Society for Economic Design, 2017.
Social Choice and Welfare Economics Prize Lecture, Lund Sweden, 2016.
Frank Knight Memorial Lecture, Cornell University, 2016.
"What Really Matters in Designing School Choice Mechanisms," Invited lecture, 11th World

Congress of the Econometric Society, Montreal, 2015.
"Econometrics of Matching," *Econometrics Journal Special Session*, Royal Economic Society, 2015.
Condorcet Lecture at Social Choice and Welfare Conference, 2014.
Lloyd Shapley Lecture for "distinguished game theorist aged 40 or under" at the World Congress of the Game Theory Society, Istanbul, 2012.
Keynote Speaker, ECORE Summer School on "Market Failure and Market Design," 2011.
Keynote Lecture, 15th Annual Coalition Theory Workshop in Marseilles, 2010.

Teaching

Graduate: Microeconomic Theory (PhD), Market and Mechanism Design (PhD), Labor Economics (PhD), Education Reform (MBA), Short-courses in Market Design (NBER, Hebrew University, ECARES, Princeton, AEAs, Econometric Society)

Undergraduate: Microeconomic Theory, Market Design

Letter writer for the following PhD students, with initial placement (* indicates primary or secondary advisor):

1. Gabriel Carroll* ('12), Stanford Economics
2. Nikhil Agarwal* (Harvard '13), MIT Economics
3. Chris Walters* ('13), Berkeley Economics
4. Anton Kolotin ('13), University of New South Wales
5. Thomas Covert* (Harvard '14), Chicago Booth
6. Christopher J. Palmer* ('14), Berkeley Haas
7. Miikka Rokkanen* ('14), Columbia Economics
8. Weiwei Hu (Duke '14), Hong Kong University of Science and Technology, post-doc
9. Ankur Mani (Media Lab '14), University of Minnesota Industrial Engineering
10. Matt Weinberg (EECS '14), Princeton CS
11. Yusuke Narita* ('16), Yale Economics
12. Peng Shi* ('16), University of Southern California Marshall School of Business, OM group
13. Camille Terrier ('16 PSE), MIT post-doc $\rightarrow$ University of Lausanne
14. Peter Hull* ('17), University of Chicago Economics

15. Elizabeth Setren* ('17), Tufts Economics
16. Christos Tzamos (EECS '17), University of Wisconsin Madison CS
17. Alonso Bucarey* ('18), Amazon
18. Daniel Waldinger* ('18), New York University Economics
19. Fei Song* ('19), Facebook
20. Arda Gitmez* ('19), Post-doc Harris School University of Chicago, Bilkent University
21. Román Andrés Zárate* ('19), University of Toronto
22. Will Rafey* ('20), UCLA
23. Lorenzo Neri ('20 QMUL), University of St. Andrews
24. Clemence Idoux* ('21), University of Pennsylvania, Wharton School
25. Joseph Shayani* ('22), Facebook
26. Oğuzhan Celebi* ('23), Stanford University post-doc
27. Viola Corradini* ('24), Columbia post-doc, Wisconsin Economics
28. Mohit Karnani* ('24), Harvard University post-doc
29. Hannah Ruebeck* ('24), Hamilton College
30. Anna Russo ('24), Harvard SoF, Harvard Economics

6/2024

Previous Testimony

1. Iowa Public Employees' Retirement System et al., vs. Bank of America Corporate, et. al.
   Civil Action No.: 17 Civ. 6221 (KPF) (SLC)
   Deposition on May 5, 2021

APPENDIX B: MATERIALS RELIED UPON & MATERIALS CONSIDERED

MATERIALS RELIED UPON

Academic Works

1. Gale, D., and Shapley, L. (1962). *College Admissions and the Stability of Marriage*. American Mathematical Monthly, 69: 9-15.
2. Agarwal, N. and Budish, E. (2021). *Market Design*. NBER Working Paper. Working Paper 29367.Available at https://www.nber.org/system/files/working_papers/w29367/w29367.pdf.
3. Vulkan N., Roth A.E., and Neeman Z. *The Handbook of Market Design*. Oxford University Press, 2013. Available at https://doi.org/10.1093/acprof:oso/9780199570515.001.0001. (Introduction)
4. Mankiw G.N., *Principles of Economics*, Cengage, 2015. Chapter 7.
5. Roth, A. E. 2018. *Marketplaces, Markets, and Market Design*. American Economic Review, 108 (7): 1609-58.
6. Roth, A. E., and M. Sotomayor. Two-Sided Matching: A Study in Game-Theoretic Modeling and Analysis. Econometric Society Monographs. Cambridge University Press, 1990. Chapter 2.
7. Pathak, P. A., & Sönmez, T. (2013). *School admissions reform in Chicago and England: Comparing mechanisms by their vulnerability to manipulation*. American Economic Review, 103(1), 80-106.
8. Abdulkadiroğlu, A., & Sönmez, T. (2003). *School Choice: A Mechanism Design Approach*. American Economic Review, 93: 729-747.
9. Roth, A.E., & Sönmez, T., and Utku Unver, M. (2005*). Pairwise Kidney Exchange. Journal of Economic Theory*, 125(2): 151-188.
10. Roth, A.E. (1984). *The Evolution of the Labor Market for Medical Interns and Residents: A Case Study in Game Theory*. Journal of Political Economy, 92: 991-1016.
11. Sönmez, T., and Switzer, T. (2013). *Matching with (Branch-of-Choice) Contracts at the United States Military Academy*. Econometrica, 81(2): 451-488.
12. Kelso, A.S., Crawford, V. (1982). *Job Matching, Coalition Formation, and Gross Substitutes*. Econometrica, 50: 1483-1504.
13. Bulow, J., Levin, J. (1982). *Matching and Price Competition*. American Economic Review, 96 (3): 652-668.
14. Roth, A. E., and Ockenfels, A. (2002). *Late-Minute Bidding and the Rules for Ending Second-Price Auctions*: Evidence from eBay and Amazon. American Economic Review, 92(4): 1093-1103;
15. Ely, J.C. and Hossain, T. (2009). *Sniping and Squatting in Auction Markets*. American Economic Journal: Microeconomics, 1(2): 68-94.
16. Edelman, B., Ostrovsky, M., and Schwarz, M. (2007*). Internet Advertising and the Generalized Second Price Auction: Selling Billions of Dollars of Keywords*. American Economic Review, 97(1): 242-259.
17. Haeringer, G. *Market Design: Auctions and Matching. Chapter 1.3.1 What a Market Needs to Work*. The MIT Press, 2017. pg. 3-4.
18. Pathak P.A. *What Really Matters in Designing School Choice Mechanisms*. In: *Honoré B*, Pakes A, Piazzesi, M., Samuelson L, eds. Advances in Economics and Econometrics: Eleventh World Congress. Econometric Society Monographs. Cambridge University Press; 2017:176-214.
19. Maskin, E. (2001). *Auctions and efficiency*. In: Dewatripont, M., Hansen, L., Turnovsky, S. Advances in Economic Theory (invited lectures from the 8th World Congress of the Econometric Society). Cambridge University Press; 2003. pp. 1-24.
20. McAfee, R.P., and McMillan, J. (1987), *Auctions and Bidding*. Journal of Economic Literature, 25(2), 699-738, page 711.
21. Roth, A.E., *Who gets what and why: the new economics of match making and market design*, Houghton Mifflin Harcourt, 2015, at p. 11.

22. Abdulkadiroglu, A., Pathak P. A., and Roth A. E. (2009). *Strategy-proofness versus Efficiency in Matching with Indifferences: Redesigning the New York City High School Match*. American Economic Review, 99(5), 1954–1978.
23. Pathak, P.A., and Sönmez, T. (2008). *Leveling the Playing Field: Sincere and Sophisticated Players in the Boston Mechanism*. American Economic Review, 98(4), pp.1636-52.
24. Barwick, P.J., Pathak P.A., and Wong, M. (2017). *Conflicts of Interest and Steering in Residential Brokerage*. American Economic Journal: Applied Economics, 9 (3): 191-222.
25. Vickrey, W. (1961). *Counterspeculation, Auctions, and Competitive Sealed Tenders*. The Journal of Finance, 16(1), 8–37. Available at https://doi.org/10.2307/2977633.
26. Cai, H., Riley, J., & Ye, L. (2007). *Reserve price signaling*. Journal of Economic Theory, *135*(1), 253-268
27. Morton, F.M.S. et al. (2023). Equitable Interoperability: The "Supertool" of Digital Platform Governance. Yale Journal on Regulation. 40(3): 1013-1055 at-1016.

Public Information

1. "The Prize in Economic Sciences 2012." Nobel Prize Outreach AB 2024. (Jun 6. 2024). Accessed on June 7, 2024. Available at https://www.nobelprize.org/prizes/economic-sciences/2012/summary/
2. "Understanding Brand Safety & Brand Suitability in a Contemporary Media Landscape - The Best Practices Guide to Concepts, Definitions, Tools, and Transactional Applications" IAB, December 2020. Accessed on June 7, 2024. Available at https://www.iab.com/wp-content/uploads/2020/12/IAB_Brand_Safety_and_Suitability_Guide_2020-12.pdf
3. U.S. Securities and Exchange Commission. "Information for Newly-Registered Investment Advisers" (November 23, 2010). Accessed on June 7, 2024. Available at https://www.sec.gov/divisions/investment/advoverview.htm
4. The Wall Street Journal. "A Big Legal Defeat for the Realtors." (October 31, 2023). Accessed on June 7, 2024. Available at https://www.wsj.com/articles/burnett-v-national-association-of-realtors-lawsuit-real-estate-home-buyers-sellers-8c6466dd
5. Google Ad Manager Help. "House line items". Accessed on June 7, 2024. Available at https://support.google.com/admanager/answer/79305?hl=en.
6. Roth, A.E. (2007). *The Art of Designing Markets. Harvard Business Review*. Accessed on June 7, 2024. Available at https://hbr.org/2007/10/the-art-of-designing-markets.
7. Think with Google. "The Buyer's Guide to Programmatic Direct." Google Whitepaper (July 1, 2016). Accessed on June 7, 2024. Available at https://www.thinkwithgoogle.com/intl/en-apac/marketing-strategies/automation/buyers-guide-programmatic-direct/
8. Google Ad Manager Help. "Ad selection white paper." Accessed on June 7, 2024. Available at https://support.google.com/admanager/answer/1143651#overview_of_the_ad_selection_process
9. Google Ads. "Reach a larger or new audience with Google Display Network targeting." (March 20, 2023). Accessed on June 7, 2024. Available at https://ads.google.com/intl/en_us/home/resources/articles/reach-larger-new-audiences/
10. Google Ad Manager. Sissie Hsiao, Vice President and GM, Apps, Video, and Display Advertising at Google. "How our display buying platforms share revenue with publishers." (June 23, 2020). Accessed on June 7, 2024. Available at https://blog.google/products/admanager/display-buying-share-revenue-publishers/
11. Google. "Display Smart Bidding Guide." Accessed on June 7, 2024. Available at https://services.google.com/fh/files/misc/gda_smart_bidding_guide.pdf
12. Google Ads Help. "About dynamic remarketing: show ads tailored to your site and app visitors." Accessed on June 7, 2024. Available at https://support.google.com/google-ads/answer/3124536?hl=en
13. Display & Video 360, Google Marketing Platform. Accessed on June 7, 2024. Available at https://marketingplatform.google.com/about/display-video-360
14. Display & Video 360 Help. "Create and use a custom bidding script." Accessed on June 7, 2024. Available at https://support.google.com/displayvideo/answer/9728993?hl=en
15. Display and Video360, Google Marketing Platform. Accessed on June 7, 2024. Available at https://marketingplatform.google.com/about/contact-us/

16. GoogleAds. “Start Now” to create a GoogleAds account and begin managing campaigns. Accessed on June 7, 2024. Available at https://ads.google.com/intl/en_us/start/overview.
17. Prebid. “A Video Introduction to Header Bidding.” Accessed on June 7, 2024. Available at https://docs.prebid.org/overview/intro-to-header-bidding-video.html
18. Australian Competition and Consumer Commission. “Digital Platforms Inquiry: Final Report.” June 2019, Accessed on June 7, 2024. Available at https://www.accc.gov.au/system/files/Digital%20platforms%20inquiry%20-%20final%20report.pdf
19. Sarah Sluis, AdExchanger. "The Rise Of ‘Header Bidding’ And The End Of The Publisher Waterfall" (Jun. 18, 2015). Accessed on June 7, 2024. Available at https://www.adexchanger.com/publishers/the-rise-of-header-bidding-and-the-end-of-the-publisher-waterfall/
20. Google Ad Manager Help. “Learn the basics: How Open Bidding works -Life cycle of an Open Bidding request.” Accessed on June 7, 2024. Available at https://support.google.com/admanager/answer/7128958?hl=en&ref_topic=7512060&sjid=6818735359518079257-NC
21. Australian Competition & Consumer Commission, August 2021. “Digital advertising services inquiry - final report.” Accessed on June 7, 2024. Available at https://www.accc.gov.au/system/files/Digital%20advertising%20services%20inquiry%20-%20final%20report.pdf
22. Business Insider. March 22, 2017. “Facebook made an unprecedented move to partner with ad tech companies — including Amazon — to take on Google.” Accessed on June 7, 2024. Available at https://www.businessinsider.com/facebook-announces-move-into-header-bidding-to-take-on-google-2017-3
23. Amended Complaint for Associated Newspapers Ltd. And Mail Media, Inc. v. Google LLC and Alphabet Inc., Case 1:21-cv-03446-PKC, ¶ 195.
24. U.S. Department of Justice. (October 2004). "Antitrust Division Policy Guide to Merger Remedies". Available at https://www.justice.gov/d9/pages/attachments/2019/07/30/205108.pdf
25. IAB Tech Lab. Feb. 6, 2024. Accessed June 7, 2024. Available at https://iabtechlab.com/press-releases/iab-tech-lab-releases-in-depth-analysis-of-googles-privacy-sandbox-for-public-comment-revealing-significant-challenges/
26. UK CMA. “Online platforms and digital advertising – Market study final report.” Accessed on June 7, 2024. Available at https://assets.publishing.service.gov.uk/media/5fa557668fa8f5788db46efc/Final_report_Digital_ALT_TEXT.pdf
27. US SEC. Compliance Guide on Regulation Best Interest. Accessed on June 7, 2024. Available at https://www.sec.gov/info/smallbus/secg/regulation-best-interest.
28. Texas Real Estate Commission. Chapter 531 Canons of Professional Ethics and Conduct. Accessed on June 7, 2024. Available at https://www.trec.texas.gov/agency-information/rules-and-laws/trec-rules.
29. SEC information sheet containing general information about certain provisions of the Investment Advisers Act of 1940. Accessed on June 7, 2024. Available at https://www.sec.gov/divisions/investment/advoverview.htm.
30. Speech by former SEC Chairman Jay Clayton. Accessed on June 7, 2024. Available at https://www.sec.gov/news/speech/clayton-regulation-best-interest-investment-adviser-fiduciary-duty#_ftn1.
31. U.S. Department of Justice. Antitrust Division Policy Guide to Merger Remedies. June 2011. Accessed on June 7, 2024. Available at https://www.justice.gov/atr/page/file/1098656/dl
32. GCR Insight. Merger Remedies Guide, Second Edition. Accessed on June 7, 2024. Available at https://www.weil.com/~/media/files/pdfs/2019/nonstructural-remedies.pdf.
33. European Commission press release. 17, December 2020. “Mergers: Commission clears acquisition of Fitbit by Google, subject to conditions.” Accessed on June 7, 2024. Available at https://ec.europa.eu/commission/presscorner/detail/en/ip_20_2484.
34. “Transparency of Corporate Bond Markets” OICU-IOSCO, May 2004 at page https://www.iosco.org/library/pubdocs/pdf/IOSCOPD168.pdf

35. SEC Rule on Disclosure of Order Handling Information. Available at https://www.sec.gov/news/press-release/2018-253. Accessed on June 1, 2024.

Bates Stamped Productions

1. GOOG-AT-MDL-013293467
2. GOOG-NE-04579093
3. GOOG-AT-MDL-015238842
4. GOOG-AT-MDL-001004706
5. GOOG-AT-MDL-000993446
6. GOOG-DOJ-03151263
7. GOOG-AT-MDL-004523197
8. GOOG-AT-MDL-008569591
9. GOOG-NE-03872763
10. GOOG-NE-05243813
11. GOOG-DOJ-27759140
12. GOOG-NE-07290902
13. GOOG-NE-07832078
14. GOOG-AT-MDL-013268463
15. GOOG-TEX-00036237
16. GOOG-DOJ-27799214
17. GOOG-DOJ-14954902
18. GOOG-DOJ-14826585
19. GOOG-NE-04001130
20. GOOG-DOJ-28420330
21. GOOG-NE-04826786
22. GOOG-AT-MDL-019516306
23. GOOG-NE-12146934
24. GOOG-AT-MDL-001937115
25. GOOG-AT-MDL-001941178
26. GOOG-AT-MDL-B-004260508
27. GOOG-AT-MDL-B-003844625
28. GOOG-AT-MDL-B-004267578
29. GOOG-DOJ-14837888
30. GOOG-DOJ-15583409
31. GOOG-AT-MDL-B-005115253
32. GOOG-NE-04404090
33. GOOG-DOJ-15169250
34. GOOG-DOJ-15626678
35. GOOG-DOJ-14248558
36. GOOG-NE-04430279
37. GOOG-NE-01711786
38. GOOG-NE-02097328
39. GOOG-TEX-00101777
40. GOOG-TEX-00513684
41. GOOG-NE-06724126
42. GOOG-TEX-00105361
43. GOOG-DOJ-AT-01811903
44. GOOG-DOJ-06727388
45. GOOG-AT-MDL-013291496
46. GOOG-NE-04421287
47. GOOG-TEX-00094574
48. GOOG-NE-11799063
49. GOOG-NE-13215119
50. GOOG-TEX-00084843
51. GOOG-TEX-00209387
52. GOOG-AT-MDL-002625690
53. GOOG-AT-MDL-007290350
54. GOOG-TEX-00090969
55. GOOG-TEX-00084860
56. GOOG-DOJ-AT-02204409
57. GOOG-DOJ-09715071
58. GOOG-DOJ-14024199
59. GOOG-TEX-00103579
60. GOOG-AT-MDL-013987096

61. GOOG-AT-MDL-001977826
62. GOOG-DOJ-AT-01804815
63. GOOG-NE-11809343
64. GOOG-DOJ-AT-00569648
65. GOOG-DOJ-15084405
66. GOOG-TEX-00782851
67. GOOG-NE-11725453
68. COM-00049151
69. GOOG-AT-MDL-008107072
70. GOOG-DOJ-14141075
71. GOOG-DOJ-05782415
72. GOOG-AT-MDL-001447559
73. GOOG-DOJ-28385887
74. GOOG-DOJ-27804205
75. GOOG-NE-11753797
76. GOOG-AT-MDL-006218257
77. GOOG-DOJ-AT-02471194
78. GOOG-TEX-00777528
79. GOOG-NE-04934281
80. GOOG-NE-13222752
81. GOOG-AT-MDL-019244499
82. GOOG-NE-06151351
83. GOOG-NE-09485306
84. GOOG-TEX-01008317
85. GOOG-DOJ-AT-02138562
86. GOOG-AT-MDL-007234013
87. GOOG-TEX-00656701
88. GOOG-DOJ-14430534
89. GOOG-DOJ-14298902
90. GOOG-TEX-00091188
91. GOOG-NE-13624783

Depositions referenced

1. Deposition of Sam Temes, (April 5, 2024)
2. Deposition of Yoni Wilbur (April 12, 2024)
3. Deposition of Arnaud Creput (September 05, 2023)
4. Deposition of Ryan Pauley, Vox Media (August 23, 2023)
5. Deposition of Henry Erskine-Crum (May 2, 2024)
6. Deposition of Trevor Young (May 24, 2024)
7. Deposition of Chris Tignor (April 14, 2024)

MATERIALS CONSIDERED

Discovery Responses

All available discovery responses produced within the matter of *The State of Texas, et al. v. Google*, Case Number: 4:20-cv-00957-SDJ, including:

1. The Parties' amended initial disclosures;
2. The Parties' discovery responses and objections to Interrogatories, Requests for Admission, and Requests for Production; and
3. Google's written responses to Plaintiffs' Rule 30(b)(6) Notice.

Deposition Transcripts & Exhibits

All available deposition transcripts and exhibits within the matter of *The State of Texas, et al. v. Google*, Case Number: 4:20-cv-00957-SDJ, including:

1. Deposition and Exhibits of Antil Iscen, April 1, 2024
2. Deposition and Exhibits of Timothy Lipus, April 3, 2024
3. Deposition and Exhibits of Yoni Wilbur, April 12, 2024
4. Deposition and Exhibits of Martin Pal, April 17, 2024
5. Deposition and Exhibits of Chris Tignor, April 19, 2024
6. Deposition and Exhibits of Alok Verma, April 23, 2024
7. Deposition and Exhibits of James Giles, April 26, 2024
8. Deposition and Exhibits of Suzanne Blackburn, April 26, 2024
9. Deposition and Exhibits of Bonita Stewart, April 29, 2024
10. Deposition and Exhibits of Dan Taylor, April 30, 2024
11. Deposition and Exhibits of Darline Jean, May 1, 2024
12. Deposition and Exhibits of Max Lin, May 1, 2024
13. Deposition and Exhibits of Max Loubser, May 2, 2024
14. Deposition and Exhibits of Sam Temes, April 5, 2024
15. Deposition and Exhibits of Sam Temes, May 2, 2024
16. Deposition and Exhibits of Karin Hennessey, May 10, 2024
17. Deposition and Exhibits of Alexis Shellhammer, May 15, 2024
18. Deposition and Exhibits of Genaro Lopez May 17, 2024
19. Deposition and Exhibits of Nirmal Jayaram Vol 1, April 26, 2024
20. Deposition and Exhibits of Nirmal Jayaram Vol 2, May 21, 2024
21. Deposition and Exhibits of Michael Hopkins, May 21, 2024
22. Deposition and Exhibits of Michelle Sarlo Dauwalter, May 22, 2024
23. Deposition and Exhibits of Kimberly Burchett, May 23, 2024
24. Deposition and Exhibits of Neal Mohan, May 24, 2024
25. Deposition and Exhibits of Nitish Korula Vol 1, April 19, 2024
26. Deposition and Exhibits of Nitish Korula Vol 2, May 2, 2024
27. Deposition and Exhibits of Nitish Korula Vol 3, May 3, 2024
28. Deposition and Exhibits of Nitish Korula Vol 4, May 24, 2024

29. Deposition and Exhibits of American Express, May 2, 2024
30. Deposition and Exhibits of Broadstreet, May 23, 2024
31. Deposition and Exhibits of Eileen Fisher, May 3, 2024
32. Deposition and Exhibits of Nike, May 3, 2024
33. Deposition and Exhibits of Texas Monthly, May 23, 2024
34. Deposition and Exhibits of Louisiana Office of Tourism, April 30, 2024
35. Deposition and Exhibits of Missouri Department of Transportation, May 2, 2024
36. Deposition and Exhibits of Missouri Division of Tourism, May 1, 2024
37. Deposition and Exhibits of Nevada DMV, May 1, 2024
38. Deposition and Exhibits of Montana State University, April 16, 2024
39. Deposition and Exhibits of Idaho Department of Health and Welfare, April 23, 2024
40. Deposition and Exhibits of Dentsu, April 25, 2024
41. Deposition and Exhibits of Nevada State Treasurer, April 12, 2024
42. Deposition and Exhibits of Utah Office of Tourism, April 19, 2024
43. Deposition and Exhibits of Meta, April 30, 2024
44. Deposition and Exhibits of Meta, May 2, 2024
45. Deposition and Exhibits of Florida Department of Environmental Protection, May 3, 2024
46. Deposition and Exhibits of Arkansas Department of Tourism, May 1, 2024
47. Deposition and Exhibits of MiQ Digital USA, Inc., April 22, 2024
48. Deposition and Exhibits of Texas A&M University, May 1, 2024
49. Deposition and Exhibits of Texas Department of Motor Vehicles, May 3, 2024
50. Deposition and Exhibits of The Texas General Land Office, April 29, 2024
51. Deposition and Exhibits of Walmart, Inc., April 25, 2024
52. Deposition and Exhibits of South Carolina (Rebecca Hartner), April 23, 2024
53. Deposition and Exhibits of Indiana (Jamie Weber), April 26, 2024
54. Deposition and Exhibits of Indiana (Steven Taterka), April 26, 2024
55. Deposition and Exhibits of Nevada (Lucas Tucker), April 29, 2024
56. Deposition and Exhibits of Arkansas (Chuck Harder), May 1, 2024
57. Deposition and Exhibits of Alaska (Jeff Pickett), May 3, 2024
58. Deposition and Exhibits of Florida (Andrew Butler), April 22, 2024
59. Deposition and Exhibits of Idaho (John Olson), May 3, 2024
60. Deposition and Exhibits of Idaho (Stephanie Guyon), May 3, 2024
61. Deposition and Exhibits of Kentucky (Jonathan Farmer), April 25, 2024
62. Deposition and Exhibits of Louisiana (Patrick Voelker), May 3, 2024
63. Deposition and Exhibits of Mississippi (Crystal Secoy), April 25, 2024
64. Deposition and Exhibits of Mississippi (Sid Salter), April 25, 2024
65. Deposition and Exhibits of Missouri (Michael Schwalbert), May 10, 2024
66. Deposition and Exhibits of Montana (Anna Schneider), May 1, 2024
67. Deposition and Exhibits of North Dakota (Elin Alm), May 2, 2024
68. Deposition and Exhibits of Puerto Rico (Guarinonex Diaz Martinez), May 1, 2024
69. Deposition and Exhibits of South Dakota (Jonathan Van Patten), April 29, 2024
70. Deposition and Exhibits of Texas (Trevor Young), May 24, 2024
71. Deposition and Exhibits of Texas (Justin Gordon), April 17, 2024

72. Deposition and Exhibits of Utah (Marie Martin), April 30, 2024
73. Deposition and Exhibits of Utah (Melanie Hall), April 30, 2024
74. Deposition and Exhibits of Arkansas Dept. of Parks, Heritage and Tourism (Brian Kratkiewicz), May 1, 2024
75. Deposition and Exhibits of Arkansas Dept. of Parks, Heritage and Tourism (Kristine Puckett), May 1, 2024
76. Deposition and Exhibits of Florida Dept. of Environmental Protection (Alexandra Kuchta), May 3, 2024
77. Deposition and Exhibits of Louisiana Dept. of Tourism (Jeffrey Harlan), April 3, 2024
78. Deposition and Exhibits of Missouri Dept. of Transportation (Jon Nelson), May 2, 2024
79. Deposition and Exhibits of Missouri Dept. of Tourism (Stephen Foutes), May 1, 2024
80. Deposition and Exhibits of Texas DMV (John Ralston), May 3, 2024
81. Deposition and Exhibits of Texas DMV (Shelly Mellott), May 3, 2024
82. Deposition and Exhibits of Texas General Land Office (Dimitrius "Jimmy" Smaragdis), April 29, 2024
83. Deposition and Exhibits of Texas General Land Office (Brittany Eck), April 29, 2024
84. Deposition and Exhibits of Utah Office of Tourism (David Williams), April 19, 2024

All available deposition transcripts and exhibits within the matter of *USA v. Google*, Case Number: 1:23-cv-00108-LMB-JFA, including:

85. Deposition and Exhibits of AdZerk, August, 16 2023
86. Deposition and Exhibits of Army, September 1, 2023
87. Deposition and Exhibits of Buzzfeed, August 29, 2023
88. Deposition and Exhibits of Comcast, September 6, 2023
89. Deposition and Exhibits of Criteo, September 8, 2023
90. Deposition and Exhibits of Disney, September 29, 2024
91. Deposition and Exhibits of Equativ, September 5, 2023
92. Deposition and Exhibits of GroupM, September 26, 2023
93. Deposition and Exhibits of GSD&M, September 8, 2023
94. Deposition and Exhibits of Index Exchange, September 26, 2023
95. Deposition and Exhibits of Kargo, August 9, 2023
96. Deposition and Exhibits of Magnite, August 31, 2023
97. Deposition and Exhibits of Mediavine, September 22, 2023
98. Deposition and Exhibits of Meta, September 28, 2023
99. Deposition and Exhibits of Microsoft, September 8, 2023
100. Deposition and Exhibits of NBC Universal, September 21, 2023
101. Deposition and Exhibits of New York Times, August 25, 2023
102. Deposition and Exhibits of News Corp, August 25, 2023
103. Deposition and Exhibits of NHTSA, September 22, 2023
104. Deposition and Exhibits of Brian O'Kelley, September 29, 2023
105. Deposition and Exhibits of Omnicom, August 29, 2023

106. Deposition and Exhibits of OpenX, October 26, 2023
107. Deposition and Exhibits of Trade Desk, July 28, 2023
108. Deposition and Exhibits of Vox, August 23, 2023
109. Deposition and Exhibits of Zulily, September 28, 2023
110. Deposition and Exhibits of Jonathan Bellack (November, 11, 2023)
111. Deposition and Exhibits of Tim Craycroft (August 15, 2023)
112. Deposition and Exhibits of K. Marco Hardie (November 14, 2023)
113. Deposition and Exhibits of Jason Hsueh (November 15, 2023)
114. Deposition and Exhibits of Nirmal Jayaram (November 14, 2023)
115. Deposition and Exhibits of Nitish Korula (30B6 errata only) (November 14, 2023)
116. Deposition and Exhibits of Nitish Korula (November 3, 2023)
117. Deposition and Exhibits of Chris LaSala (August 16, 2023)
118. Deposition and Exhibits of Chris LaSala (November 7, 2023)
119. Deposition and Exhibits of Eisar Lipkovitz (November 9, 2023)
120. Deposition and Exhibits of Neal Mohan (October 30, 2023)
121. Deposition and Exhibits of Apama Pappu (August 11, 2023)
122. Deposition and Exhibits of Apama Pappu (November 2, 2023)
123. Deposition and Exhibits of Vladislav Sinaniyev (November 16, 2023)
124. Deposition and Exhibits of Rahul Srinivasan (August 29, 2023)
125. Deposition and Exhibits of Ali Amini (November 14-15, 2023)
126. Deposition and Exhibits of Atil Iscen (April 1, 2024)
127. Deposition and Exhibits of Benjamin Kornacki (November 3, 2024)
128. Deposition and Exhibits of Nitish Korula (November 3, 2024)
129. Deposition and Exhibits of Nitish Korush (30(b)6) (November 14, 2023)
130. Deposition and Exhibits of Chris LaSala (August 16, 2023)
131. Deposition and Exhibits of Chris LaSala (November 7, 2023)
132. Deposition and Exhibits of Eisar Lipkovitz (November 9, 2023)
133. Deposition and Exhibits of Tim Lipus (April 3, 2024)
134. Deposition and Exhibits of Neal Mohan (October 10, 2023 and November 8, 2023)
135. Deposition and Exhibits of Martin Pal (April 17, 2024)
136. Deposition and Exhibits of Bonita Stewart (April 29, 2024)
137. Deposition and Exhibits of Nitish Korula (Noveber 11, 2023)
138. Deposition and Exhibits of Neal Mohan (October 10, 2023)

Expert Reports & Declarations

All available expert reports (with redactions) within the matter of *USA v. Google*, Case Number:

1:23-cv-00108-LMB-JFA, including:

1. Declarations of Google Employees
2. 2023.12.22 Expert Report of Gabriel Weintraub, GOOG-AT-MDL-C-000018734
3. 2023.12.22 Expert Report of R. Ravi, GOOG-AT-MDL-C-000019017
4. 2023.12.22 Expert Report of Robin S. Lee, GOOG-AT-MDL-C-000019273

5. 2023.12.22 Expert Report of Rosa Abrantes-Metz, GOOG-AT-MDL-C-000019786
6. 2023.12.22 Expert Report of Thomas S. Respess, GOOG-AT-MDL-C-000020106
7. 2023.12.22 Expert Report of Timothy Simcoe, GOOG-AT-MDL-C-000020274
8. 2024.01.13 Errata to Abrantes-Metz Expert Report, GOOG-AT-MDL-C-000020435
9. 2024.01.13 Errata to Ravi Expert Report, GOOG-AT-MDL-C-000020437
10. 2024.01.13 Errata to Respess Expert Report, GOOG-AT-MDL-C-000020440
11. 2024.01.13 Errata to Simcoe Expert Report, GOOG-AT-MDL-C-000020467
12. 2024.01.13 Errata to Weintraub Expert Report, GOOG-AT-MDL-C-000020471
13. 2024.01.23 Chevalier Expert Report, GOOG-AT-MDL-C-000020474
14. 2024.01.23 Ferrante Expert Report, GOOG-AT-MDL-C-000020714
15. 2024.01.23 Ghose Expert Report, GOOG-AT-MDL-C-000020767
16. 2024.01.23 Israel Expert Report, GOOG-AT-MDL-C-000021036
17. 2024.01.23 Milgrom Expert Report, GOOG-AT-MDL-C-000021794
18. 2024.01.23 Rinard Expert Report, GOOG-AT-MDL-C-000022191
19. 2024.01.23 Shirky Expert Report, GOOG-AT-MDL-C-000022229
20. 2024.01.23 Simonson Expert Report, GOOG-AT-MDL-C-000022290
21. 2024.01.23 Skinner Expert Report, GOOG-AT-MDL-C-000022948
22. 2024.02.13 Expert Rebuttal Report of Adoria Lim, GOOG-AT-MDL-C-000023002
23. 2024.02.13 Expert Rebuttal Report of Gabriel Weintraub, GOOG-AT-MDL-C-000023226
24. 2024.02.13 Expert Rebuttal Report of Kenneth Wilbur, GOOG-AT-MDL-C-000023322
25. 2024.02.13 Expert Rebuttal Report of R. Ravi, GOOG-AT-MDL-C-000023435
26. 2024.02.13 Expert Rebuttal Report of Robin S. Lee, GOOG-AT-MDL-C-000023516
27. 2024.02.13 Expert Rebuttal Report of Rosa Abrantes-Metz, GOOG-AT-MDL-C-000023887
28. 2024.02.13 Expert Rebuttal Report of Timothy Simcoe, GOOG-AT-MDL-C-000024064
29. 2024.02.13 Expert Rebuttal Report of Wayne Hoyer, GOOG-AT-MDL-C-000024138
30. 2024.02.13 Expert Rebuttal Report of Wenke Lee, GOOG-AT-MDL-C-000024270
31. 2024.02.16 Errata to Ravi Rebuttal Report, GOOG-AT-MDL-C-000024387
32. 2024.02.20 Errata to Simcoe Rebuttal Report, GOOG-AT-MDL-C-000024389
33. 2024.02.23 Errata to Weintraub Rebuttal Report, GOOG-AT-MDL-C-000024390
34. 2024.02.23 Supplemental Errata to Weintraub Expert Report, GOOG-AT-MDL-C-000024391
35. 2024.02.24 Errata to Wilbur Rebuttal Report, GOOG-AT-MDL-C-000024392
36. 2024.02.26 Errata to Hoyer Rebuttal Report, GOOG-AT-MDL-C-000024397
37. 2024.02.28 Errata to Abrantes-Metz Rebuttal Report, GOOG-AT-MDL-C-000024399
38. 2024.03.04 Expert Supplemental Report of Robin S. Lee, GOOG-AT-MDL-C-000024403
39. 2024.03.08 Consolidated Errata to Lee Rebuttal Report, GOOG-AT-MDL-C-000024436
40. 2024.01.13 Expert Report of Weintraub Errata, GOOG-AT-MDL-C-000040965
41. 2024.01.13 Expert Report of Simcoe Errata, GOOG-AT-MDL-C-000040961

42. 2024.01.13 Expert Report of Respess Errata_with Figure Errata_Redacted, GOOG-AT-MDL-C-000040934
43. 2024.01.13 Expert Report of R Ravi Errata, GOOG-AT-MDL-C-000040931
44. 2024.01.13 Expert Report of Abrantes-Metz Errata, GOOG-AT-MDL-C-000040929
45. 2024.03.08 Consolidated Errata to Lee Rebuttal Report, GOOG-AT-MDL-C-000040926
46. 2024.03.04 Expert Supplemental Report of Robin S. Lee, PhD, GOOG-AT-MDL-C-000040893
47. 2024.02.28 Rebuttal Report Errata of Rosa Abrantes-Metz Signed, GOOG-AT-MDL-C-000040889
48. 2024.02.25 Expert Rebuttal Report of Hoyer Errata, GOOG-AT-MDL-C-000040887
49. 2024.02.24 Wilbur Rebuttal Errata, GOOG-AT-MDL-C-000040882
50. 2024.02.23 Weintraub Rebuttal Report Errata, GOOG-AT-MDL-C-000040881
51. 2024.02.23 Expert Report of Weintraub Supplemental Errata, GOOG-AT-MDL-C-000040880
52. 2024.02.20 Errata to Simcoe Rebuttal Report, GOOG-AT-MDL-C-000040879
53. 2024.02.16 Errata to Ravi Rebuttal Report (Highly Confidential), GOOG-AT-MDL-C-000040877
54. 2024.02.13 Rebuttal Report of Rosa Abrantes-Metz, GOOG-AT-MDL-C-000040700
55. 2024.02.13 Expert Report of Wenke Lee, GOOG-AT-MDL-C-000040583
56. 2024.02.13 Expert Rebuttal Report of Wayne Hoyer, GOOG-AT-MDL-C-000040451
57. 2024.02.13 Expert Rebuttal Report of Timothy Simcoe_Redacted, GOOG-AT-MDL-C-000040377
58. 2024.02.13 Expert Rebuttal Report of Robin S. Lee_Redacted, GOOG-AT-MDL-C-000040006
59. 2024.02.13 Expert Rebuttal Report of R Ravi, GOOG-AT-MDL-C-000039925
60. 2024.02.13 Expert Rebuttal Report of Kenneth Wilbur_Redacted, GOOG-AT-MDL-C-000039812
61. 2024.02.13 Expert Rebuttal Report of Gabriel Weintraub_Redacted, GOOG-AT-MDL-C-000039716
62. 2024.02.13 Expert Rebuttal Report of Adoria Lim_Redacted, GOOG-AT-MDL-C-000039492
63. 2024.01.23 Expert Report of William Clay Shirky, GOOG-AT-MDL-C-000039431
64. 2024.01.23 Expert Report of Paul R. Milgrom, GOOG-AT-MDL-C-000039034
65. 2024.01.23 Expert Report of Martin C. Rinard, GOOG-AT-MDL-C-000038996
66. 2024.01.23 Expert Report of Mark A. Israel_Redacted, GOOG-AT-MDL-C-000038238
67. 2024.01.23 Expert Report of Judith A. Chevalier_Redacted, GOOG-AT-MDL-C-000037998
68. 2024.01.23 Expert Report of Itamar Simonson, GOOG-AT-MDL-C-000037340
69. 2024.01.23 Expert Report of Douglas Skinner, GOOG-AT-MDL-C-000037286
70. 2024.01.23 Expert Report of Anthony J. Ferrante, GOOG-AT-MDL-C-000037233
71. 2024.01.23 Expert Report of Anindya Ghose_Redacted, GOOG-AT-MDL-C-000036954
72. 2023.12.22 Expert Report of Timothy Simcoe_Redacted, GOOG-AT-MDL-C-000036793
73. 2023.12.22 Expert Report of Thomas Respess_Redacted, GOOG-AT-MDL-C-000036625
74. 2023.12.22 Expert Report of Rosa Abrantes-Metz_Redacted, GOOG-AT-MDL-C-000036305

75. 2023.12.22 Expert Report of Robin S. Lee, PhD_Redacted, GOOG-AT-MDL-C-000035792
76. 2023.12.22 Expert Report of R Ravi_Redacted, GOOG-AT-MDL-C-000035536
77. 2023.12.22 Expert Report of Gabriel Weintraub_Redacted, GOOG-AT-MDL-C-000035253

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